The Analysts Journal

LUME 8 : NUMBER 2 ☆ MARCH, 1952

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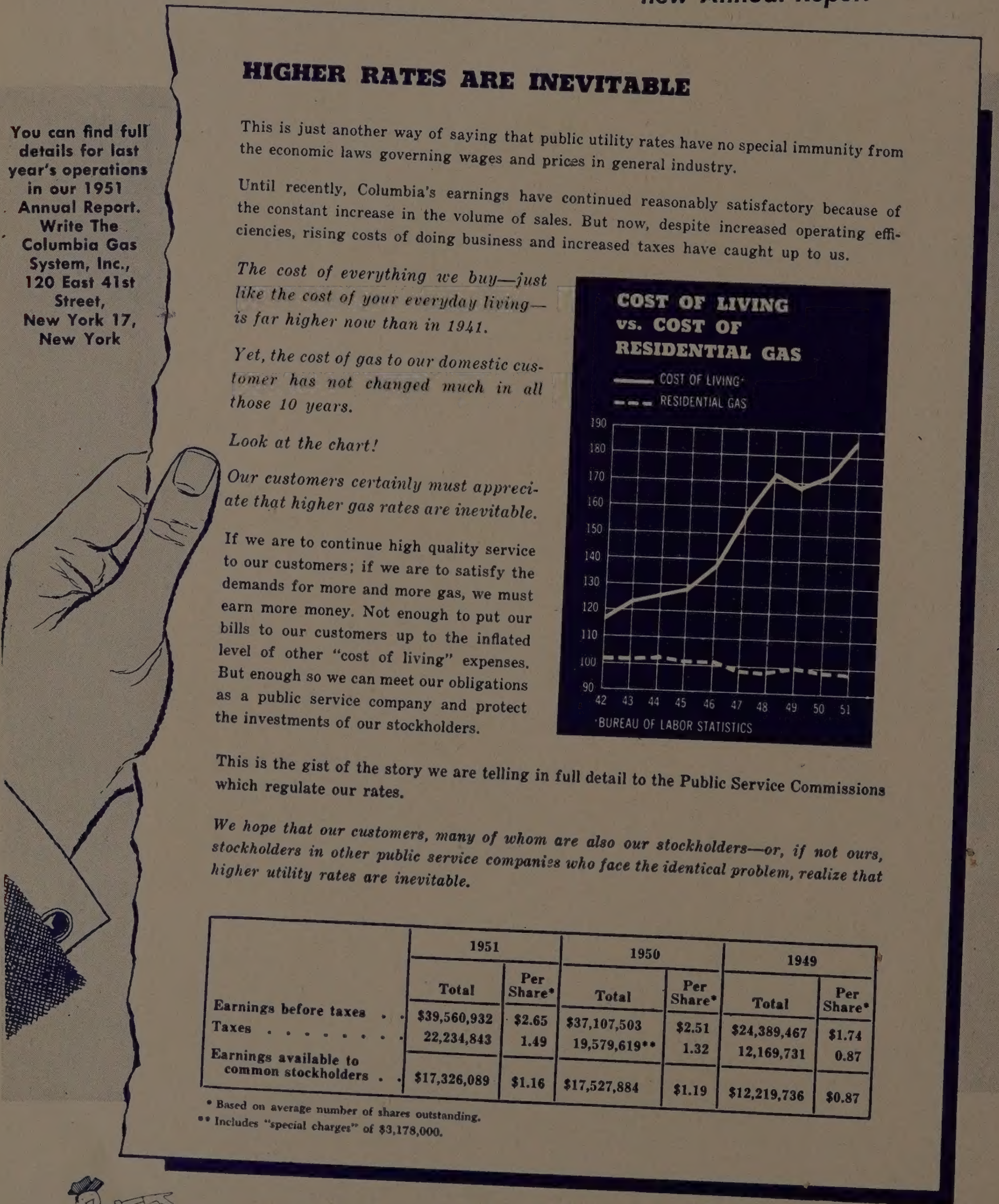
Published by

The NEW YORK SOCIETY OF SECURITY ANALYSTS, *Inc.*

The Columbia Gas System's Business Is Everybody's Business

That's why we're showing you here a page from our new Annual Report

You can find full details for last year's operations in our 1951 Annual Report. Write The Columbia Gas System, Inc., 120 East 41st Street, New York 17, New York



HIGHER RATES ARE INEVITABLE

This is just another way of saying that public utility rates have no special immunity from the economic laws governing wages and prices in general industry.

Until recently, Columbia's earnings have continued reasonably satisfactory because of the constant increase in the volume of sales. But now, despite increased operating efficiencies, rising costs of doing business and increased taxes have caught up to us.

The cost of everything we buy—just like the cost of your everyday living—is far higher now than in 1941.

Yet, the cost of gas to our domestic customer has not changed much in all those 10 years.

Look at the chart!

Our customers certainly must appreciate that higher gas rates are inevitable.

If we are to continue high quality service to our customers; if we are to satisfy the demands for more and more gas, we must earn more money. Not enough to put our bills to our customers up to the inflated level of other "cost of living" expenses. But enough so we can meet our obligations as a public service company and protect the investments of our stockholders.

COST OF LIVING vs. COST OF RESIDENTIAL GAS

*BUREAU OF LABOR STATISTICS

This is the gist of the story we are telling in full detail to the Public Service Commissions which regulate our rates.

We hope that our customers, many of whom are also our stockholders—or, if not ours, stockholders in other public service companies who face the identical problem, realize that higher utility rates are inevitable.

	1951		1950		1949	
	Total	Per Share*	Total	Per Share*	Total	Per Share*
Earnings before taxes	$39,560,932	$2.65	$37,107,503	$2.51	$24,389,467	$1.74
Taxes	22,234,843	1.49	19,579,619**	1.32	12,169,731	0.87
Earnings available to common stockholders	$17,326,089	$1.16	$17,527,884	$1.19	$12,219,736	$0.87

* Based on average number of shares outstanding.

** Includes "special charges" of $3,178,000.

THE COLUMBIA GAS SYSTEM

CHARLESTON GROUP: United Fuel Gas Company, Atlantic Seaboard Corporation, Amere Gas Utilities Company, Virginia Gas Distribution Corporation, Virginia Gas Transmission Corporation, Big Marsh Oil Company, Central Kentucky Natural Gas Company; **COLUMBUS GROUP:** The Ohio Fuel Gas Company; **PITTSBURGH GROUP:** The Manufacturers Light and Heat Company, Binghampton Gas Works, Cumberland and Allegheny Gas Company, Home Gas Company, The Keystone Gas Company, Inc., Natural Gas Company of West Virginia; **OIL GROUP:** The Preston Oil Company.

ADVERTISEMENT

Advertising—a force for growth

Every growing company, in order to help maintain its growth, must invest substantial amounts of money in advertising and sales promotion, just as it invests large sums in research and additional plants. Advertising expenditures are capital investment in the true sense of the word, for intangible as good will is, it is one of the most important assets any company possesses.

The growth of Celanese Corporation of America--paralleling or even outstripping the phenomenal growth of acetate fiber, its principal product--may be attributed in part to the Company's advertising expenditures over the last 25 years--efforts which have established the trademark "Celanese" as the best known in the textile field. This has been accomplished in spite of the fact that acetate fiber had no distinctive name of its own. Under Federal Trade Commission rules, it was known as rayon, though its characteristics are different from any other natural or chemical fiber. Now, however, the F.T.C., as a result of industry and public demand, has ruled that henceforth acetate is to be known and identified by its own distinctive name.

Acetate fiber, because it possesses a combination of desirable qualities not found in the new special-purpose chemical fibers, has already established itself with the leading mills, manufacturers, and retailers, as a basic textile fiber for every kind of beautiful apparel and home furnishings fabric. But its name has been little known to consumers. Now a great opportunity exists for advertising to educate the public to recognize and accept acetate as a leading textile fiber--a position which it has already secured within the industry.

Recognizing the public's demand for basic fiber information at this time, our Company has planned and already undertaken the most extensive advertising and promotional campaign in textile history. This includes network television, general magazines, women's books, fashion and home magazines, and leading trade papers, as well as extensive identification, educational and promotional programs. It is expected that through these modern means of mass communication, the term acetate will be firmly established with consumers as a great textile fiber, which will continue to grow in public acceptance as it has in the past. For that reason, advertising will continue to be a great force for growth in our Company's production and sales.

Harold Blancke
President

CELANESE CORPORATION OF AMERICA, 180 MADISON AVENUE, NEW YORK 16
CHEMICALS...CHEMICAL FIBERS AND YARNS...TEXTILES...PLASTICS...CELLULOSE

The best-known name in glass . . .

means more than glass!

Highest manufacturing standards, continuous research and skillful merchandising have made "Pittsburgh" one of the best-known names in the paint industry . . . a name that stands for first quality.

The highly successful Paint Division of the Pittsburgh Plate Glass Company operates 14 plants advantageously located throughout the country. In addition, a carefully balanced program of plant expansion and modernization is carried on to keep the Division in step with increasing demand.

As well as such famous products as Pittsburgh Wallhide, Pittsburgh Sun-Proof, Pittsburgh Florhide and Pittsburgh Waterspar, the Division makes varnishes, special finishes, plastics, paint oils, automotive finishes, industrial coatings and insecticides.

Pittsburgh Paint products are sold by more than 10,000 progressive dealers from coast-to-coast. These are supplied through a distribution system composed of over 200 Pittsburgh Plate warehouses and service centers. In addition, the Paint Division maintains a special engineering sales staff to cooperate with industrial customers in the development of specialized finishes for an almost endless variety of applications ranging from anti-skid coatings for tanks to home appliances and heat-reducing aircraft finishes.

Yes, the finest name in glass also means . . . Paint!

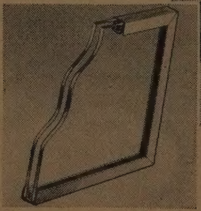
Send for our FREE illustrated folder

It explains our history and development and presents a panoramic conception of our operations and affiliations. Write to Pittsburgh Plate Glass Company, Dept. PR-105, 632 Duquesne Way, Pittsburgh 22, Pennsylvania.

PAINT DIVISION—Fourteen plants. Paints, varnishes and special automotive and industrial finishes are major products. Others are plastics, paint oils, industrial coatings and insecticides.

MERCHANDISING DIVISION—194 stores and warehouses located advantageously throughout the nation.

COLUMBIA - SOUTHERN CHEMICAL CORPORATION, A WHOLLY OWNED SUBSIDIARY—Five chemical plants and one coal mine.



GLASS DIVISION—Eight glass plants and one Pittco Metal plant.

BRUSH DIVISION—Three plants producing paint, varnish and motor-driven industrial brushes, brush handles and synthetic bristles.

PAINTS · GLASS · CHEMICALS · BRUSHES · PLASTICS

PITTSBURGH PLATE GLASS COMPANY

The Analysts Journal

MARCH
1952

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Editorial

BECAUSE OF THE REAL DEBT of gratitude owing Mr. Pierre R. Bretey, President of the National Federation of Financial Analysts Societies and Editor of THE ANALYSTS JOURNAL, this issue is gratefully dedicated to him by the staff and his large number of well wishers.

In this first quarter issue of the JOURNAL, as is our custom, a particular subject is discussed. At the suggestion of Mr. Jeremy C. Jenks, President of the New York Society of Security Analysts, we have decided on "The Effects of Science on Securities" as our theme. Mr. Jenks's constant study in this field made his advice worthy of consideration. We therefore present to you these studies.

To bring to our readers information concerning technical advancements from authoritative sources, we have secured articles by leaders in many fields. The interpretation of this picture of scientific progress will be, we trust, of practical value to you. This is our hope.

Helen Slade
MANAGING EDITOR

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Our

PIERRE R. BRETEY, editor in chief of THE ANALYSTS JOURNAL and President of the National Federation of Financial Analysts Societies has for many years served as railroad analyst for Baker, Weeks & Harden. Reports and articles by Mr. Bretey on railroads are among the most distinguished in the financial field. He teaches at the Stock Exchange Institute and is well known as a lecturer. He is a past president of the New York Society of Security Analysts.

R. E. ZIMMERMAN, vice-president of U. S. Steel Corporation of Delaware, is a member of the metallurgical advisory board of Carnegie Institute, of the research committee of the Army Ordnance Association, and of the Committee on Standards of the U. S. Department of Commerce. He was consulting chemical engineer with the U. S. Bureau of Mines in World War II and is a past president of American Standards Association.

JOSEPH S. DAVIS has been director of the Food Research Institute of Stanford University since 1921 and professor of economic research since 1938. He has served as chief economist for the Federal Farm Board; consultant for Brookings Institution; statistician for the American Shipping Mission, London, and for the Allied Maritime Transport Council; and as a member of the food and nutrition board and of the agriculture board of the National Research Council. He was contributing editor to the *Review of Economic Statistics* from 1919 to 1925 and is a past president of the Economics Association, the Statistical Association, and the Farm Economics Association.

CHARLES TATHAM, JR., vice-president of Institutional Utility Service, Inc., contributed the four chapters on public utility analysis to the new edition of *Security Analysis*. His article in this issue gives expanded treatment to one phase of the subject which, he believes, deserves additional discussion.

HENRY J. SIMONSON, JR. is president and chairman of the board of National Securities & Research Corporation, which he helped to organize in 1930. He has had thirty-two years experience in finance and investments. Before 1930 he was a member of a well-known analytical staff, worked on a financial magazine, and later became president of two large financial corporations. He has written many business and financial articles and has addressed important groups on business and finance throughout the country.

JOHN H. LEWIS is president and director of the John H. Lewis Fund, a diversified management investment company of the open-end type. Since January 1941 Mr. Lewis has been senior partner of John H. Lewis & Company, members of the New York Stock Exchange. Before then he headed the research department of Goodbody & Company for eleven years. From 1923 through 1929 he was on the reportorial staff of the *Wall Street Journal* and was railroad editor when he resigned from that paper in January 1930.

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ALBERT J. McINTOSH has been economist with Socony-Vacuum Oil Company since 1937. He is chairman of the statistical advisory committee of the American Petroleum Institute, which committee received a certificate of appreciation from the Institute. A member of the New York State Chamber of Commerce, he is adviser to several Government agencies on petroleum statistics and economics and is an author and speaker on petroleum subjects.

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HOWARD J. CARSWELL is now manager of the publicity department of the Guaranty Trust Company of New York. For a number of years he was a business and financial writer for the New York *World-Telegram*. This article is a journalistic view of a great technological trend. Mr. Carswell is an engineering graduate of Purdue University.

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E. A. ROBERTS, vice-president in charge of research and development for Armstrong Rubber Company, has been with that company since January 1950. Before that time he was manager of the tire design division for Firestone, during which time he received a Presidential Citation for development of new military airplane tires. During the war years he was consulting engineer on establishment of military airplane tire production in England, India, and South Africa.

WILLIAM B. HANKLA, JR., is editor of *Automobile Facts*, a publication of the Automobile Manufacturers Association. Before entering the automotive publications field three years ago, he was engaged in newspaper work in Chicago, Detroit, and Kansas.

THE ALEXANDER AWARD for the best and most helpful article appearing in THE ANALYSTS JOURNAL for 1951 has been given to Marcus Nadler for his study in the first quarter issue, by the decision of the judges: Pierre R. Bretey, Jeremy C. Jenks, and Shelby C. Davis.

Trans-American Photo Service

HERBERT B. DRAKE

Member, Admission Standards Committee, NFFAS, and Member, Board of Governors, and Secretary-Treasurer, Security Analysts of San Francisco

W. STURGIS MACOMBER

Chairman, House Committee, and Member, Executive Committee, New York Society of Security Analysts

Rockwell Report

by W. F. ROCKWELL, JR.
President
Rockwell Manufacturing Company

THE MANAGEMENT OF A GROWING BUSINESS is more and more a group proposition. Today's complex laws, taxes, engineering and research developments, raw material restrictions and other problems have made business specialization almost a necessity.

For instance, in the Rockwell Manufacturing Company, major decisions are made by one or another of several management committees. A case in point is our Products Committee. Members are the top staff men in the engineering, finance, operating, sales and market research departments, together with a representative plant manager.

All new products, product development programs, even *requests* for new products are reviewed by this group. Market research asks, is there a need? Engineering wants to know is the design sound? Finance says, can it be built profitably? Sales looks at the distribution pattern. Operations and the plant manager want to know if facilities are now available or what equipment will we have to acquire?

Screened by such a committee a new product, if approved, stands a good chance of success, but a group like this is far more valuable to management as a creative unit than as a check, for in the process of looking at a development program the committee frequently comes up with another product or need with even broader possibilities than the one it set out to analyze.

* * *

Many industries use a half dozen or more Rockwell-made products. A single sulphur plant in the Gulf Coast area has our water meters on flooding lines, Nordstrom valves on process lines, Edward valves in the power plant, regulators and orifice meters on gas lines, and Delta tools in the maintenance shop.

* * *

Quick case histories of production savings through uses of Rockwell-built Delta power tools: The Judge Neon Sign Company, Albany, N.Y., used to rivet metal letters on signs; now, a Delta spot welder eliminates rivets and cuts production time over 50% . . . Albert Specialty Co., Chicago, drills, counter-sinks and taps six holes in the end of each tripod tube it makes on a combination Delta drill press; tubings and castings are drilled simultaneously making tripods interchangeable and doubling production from earlier single-operation method . . . Ohio Brass Company, Mansfield, O., eliminated scrap in drilling and reaming forged aluminum blanks for fuse components by installing Delta drill presses in sequence with automatic stops on the table for quick, accurate positioning . . . Acro Manufacturing Co., Columbus, O., in drilling holes in small switches to .004 in., plus or minus .0005 in., formerly used two operations, drilling from either side; with Delta super-high speed drill presses the operation can be completed from one side with reduced scrap.

* * *

Recently at a convention, one customer with whom we had done business for some time, expressed surprise that so many of our executives were so young. Another customer said he was surprised to find that in such a young company so many officers had been around so long. The answer, of course, is that as Rockwell Manufacturing Company has grown and other companies have affiliated with us, we have become a young and old company at one and the same time. Many of our divisions have been in business for over 50 years and their key executives have years of experience behind them. In other cases, we have acquired young companies or started new divisions, often headed by enthusiastic and visionary young men. The result, we think, gives nice balance to our management group.

One of a series of informal reports on the operations and growth of the
ROCKWELL MANUFACTURING COMPANY
PITTSBURGH 8, PA.
for its customers, suppliers, employees, stockholders and friends.

MINNEAPOLIS GAS COMPANY
739 Marquette Avenue
Minneapolis 2, Minnesota

Common Stock Dividend

The Board of Directors of Minneapolis Gas Company, at a meeting held on January 10, 1952, declared a dividend of 27½ cents per share payable in cash on February 9, 1952, to common stockholders of record at the close of business January 25, 1952.

H. K. WRENCH, *President*

SUBURBAN PROPANE GAS CORPORATION

REGULAR QUARTERLY DIVIDEND NO. 24 DECLARED

Common Stock — 25¢ per share

Payable March 3, 1952 to stockholders of record February 15, 1952.

R. GOULD MOREHEAD,
Treasurer
January 29, 1952

CREPED PAPERS • GIFT WRAPPINGS

DIVIDEND NOTICES

Debenture: The regular quarterly dividend of $2.00 per share on the Debenture Stock will be paid Mar. 3, 1952, to stockholders of record Feb. 11, 1952.

"A" Common and Voting Common: A quarterly dividend of 30 cents per share on the "A" Common and Voting Common Stocks will be paid Mar. 3, 1952, to stockholders of record Feb. 11, 1952.

A. B. Newhall, *Treasurer*

Dennison Manufacturing Co.
Framingham
Mass.

108th year

JEWELRY BOXES • COMMERCIAL BOXES
MARKING DEVICES • GUMMED PAPERS
TAGS • SEALS • LABELS

THE COLUMBIA GAS SYSTEM, INC.

The Board of Directors has declared this day the following regular quarterly dividend:

Common Stock
No. 70, 20¢ per share

payable on February 15, 1952, to holders of record at close of business January 19, 1952.

DALE PARKER
Secretary
January 3, 1952

For the Analyst—What?

THE EMPLOYMENT COMMITTEE of the New York Society of Security Analysts is faced with a grave problem. We have given thought to and entered on detailed study of this dilemma, and now bring it to the attention of members. Great difficulty has developed in finding employment for men who have attained maturity. The forty-or-over time of life seems to be displeasing to employers.

There are now times when intellectually trained persons who can boast of years of top experience find themselves jobless. Usually through no fault of their own—for both firms and departments sometimes cease to exist. When this occurs, employees are forced to seek employment elsewhere.

It is told that work of great merit has been contributed in the sciences, arts, medicine, and law by older men, and that some ranking statesmen are beyond the dawn of youth. They apparently function mentally long after ball players, skaters, or prize fighters reach the decline of top physical co-ordination.

We have studied the subject. We have spoken with authorities in Washington, to research departments concerned with insurance matters, to unions, and to scholars. We have read "late in life" retirement plans, such as brought out by the Bankers Trust. They have not the answer. Some managements tell us the pensions are to blame. This is certainly an overstatement, since pension demands may be waived, or per diem payments need not include such indemnities.

The Greeks thought experience of age an advantage; some barbarian states legally put those who survived beyond the time of lightly jumping from crag to crag to death. Doctor Osler espoused this thought; later it was learned "Life Begins at Forty." Which—for the analyst?

We send you our findings, and ask your thoughts and suggestions. It is your problem too—or it may be.

HELEN SLADE
SCHROEDER BOULTON
LANCASTER GREENE
D'ARCY PARROTT
DONALD RANDELL

The Employment Committee
New York Society of Security Analysts

A Message from the Convention Chairman

We are very pleased that this issue of the Journal includes much additional information about the Fifth Annual Convention in San Francisco and Los Angeles next May. We know that publication in the Journal constitutes a direct message to analysts in all of the Societies of the Federation and to hundreds of others who read the Journal without fail.

NONMEMBERS WELCOME

From the experience of previous Conventions it is known that many bank executives, partners of firms, and others in financial communities, who may not be members of one of the Societies, are interested in attending the annual meetings of the Federation. They will be most welcome in San Francisco and Los Angeles. If you know of nonmember individuals who may have in mind coming to the West Coast for the Convention, please show them this copy of the Journal or suggest that they write for further details.

May I call your attention specifically to the sections herein pertaining to the Convention program, field trips, hotel reservations, and Convention committees? The several committee chairmen have been doing a splendid job for several months in creating the framework of the 1952 Convention. Now, with the active aid of all members of their respective committees, the necessary "flesh and bones" are being added to insure its success. Within the next few weeks, we expect to have all major arrangements completed and ready for the hundreds of visiting analysts to converge on San Francisco, including those traveling via the railroad tour under the energetic and capable direction of Pierre Bretey.

EACH SOCIETY REPRESENTED

You will note that each Society is represented by one or more members on the registration, field trips, and publicity committees. Of immediate importance is the matter of *registration*. A canvass of each Society to determine probable Convention attendance is being made. It will be of great assistance if you will make definite plans and advise your local registration committee members accordingly as soon as possible. Then the field trips committee will be in a position to make up reservation lists for the various trips on the West Coast, some of which will have to be limited in size. To avoid a "last minute" rush, and to participate in the trips of your choice, we strongly recommend getting your registration in at an early date!

Advance hotel reservations in San Francisco and Los Angeles will be a *must* for analysts coming to California. We are proceeding in the belief that it is best for each Convention registrant to obtain his own hotel reservation according to individual preference of rooms and costs. Hotel space has been set aside for the Convention in both San Francisco and Los Angeles, but again, to avoid last minute confusion, write at once to the hotel of your choice for reservations and obtain definite confirmation.

Early travel reservations are also vital. Those of you joining in the railroad tour with Pierre Bretey and Ken Woodworth will of course have train transportation arranged for that trip. If you are not coming on the special train, then it is necessary for you to make separate travel reservations, depending on your itinerary and preference. San Francisco is served by the great transcontinental railroads and air transport systems, any one of which will gladly help you work out a schedule and cost of travel according to your cost budget. We wish to stress, however, the importance of arriving in San Francisco by the afternoon of Sunday, May 4, at the latest. The Convention starts bright and early Monday morning (9 A.M.), so that formal registration at the Fairmont Hotel must be completed before that time.

The events in Los Angeles begin early Friday morning, May 9. You should arrange to have your hotel reservation at the Ambassador Hotel for that morning. It will be the "headquarters" and starting point for all field trips in Los Angeles.

TRIP IS TAX-DEDUCTIBLE

It is important to remember that the cost of your trip to the Convention will be a proper business expense for tax deduction purposes—an important fact in figuring the *net* cost of participating in a week or more of research on the West Coast.

Although the program speeches will be printed in the Journal, in accordance with past custom, we anticipate that it may be some months after the Convention before a Proceedings issue can be published. In any event it will not be possible to provide coverage of the numerous field trips, conferences at company plants, and so on. The moral of this is simply: There will be no good substitute for actual attendance and participation in the many events to take place during the Convention week.

FREE TIME FOR RELAXATION

In reviewing the intensive Convention schedule, some of you may be wondering about having "free time" in San Francisco and Los Angeles for visits with friends or relatives or just for relaxation. Analysts arriving on Sunday, May 4, will have that night free except for those who participate in the directors dinner and annual business meeting. On Monday, May 5, all registrants will be the guests of Dean Witter & Company at a late afternoon reception.

We are especially pleased to report that on Tuesday evening, May 6, the Convention will be the guests of the San Francisco Stock Exchange at the beautiful Exchange Building for a reception and entertainment. Registrants can plan their own dinner arrangements that night, as well as on Wednesday, May 7, after returning from the field trips in the afternoon.

Those going to Los Angeles will presumably leave (by either rail or airplane) on the night of Thursday, May 8, although some may wish to take an early morning flight on Friday, May 9. After the field trips in Los Angeles, the

Los Angeles Stock Exchange will be hosts at a reception to be held in the Ambassador Hotel in the late afternoon, preceding the closing dinner. Some highly interesting tours are arranged in Los Angeles for Saturday morning, May 10, but the afternoon and evening will be free for sightseeing, shopping, and other features that make Los Angeles and Hollywood famous the world over.

REGISTRATION FEE

This report would not be complete without a reference to the Convention registration fee. We anticipate that it will be set at $25 per capita. This will include admission to all forums, the two luncheons and dinner at the Convention in San Francisco, as well as the field trips in the Bay Area. The field trips and closing dinner in Los Angeles will be offered to visiting analysts without charge—with the Los Angeles Society as our genial hosts.

On behalf of the Convention committees may I extend a hearty invitation to fellow analysts in all of the Federation Societies to attend the Fifth Annual Convention and help make it one long to be remembered.

RICHARD W. LAMBOURNE

Executive Vice-President and
General Convention Chairman

* * *

Train Trip

THE TRAIN TRIP has aroused tremendous interest. More persons have evidenced a desire to see American industry at work than even the most optimistic thought possible. The maximum number of accommodations allowed by the Burlington Railroad to Mr. Pierre Bretey, manager of the trip, is 200. Mr. Bretey is bending every effort to satisfy all members, but unfortunately some will have to be disappointed.

Combination Vacation and Convention

Analysts combining vacations with the Convention will find co-operation from the Broadmoor Hotel, Colorado Springs, Colo. The management will be "delighted to arrange" and furnish free transportation for junkets to Leadville, Cripple Creek, and other famous scenic spots. These will include visits to a large ranch in operation and western mountain sights. Persons desiring to avail themselves of these privileges should notify B. Barret Griffith, investment counsel, Broadmoor Hotel, Colorado Springs, Colo. Members traveling to the California meetings by airplane can arrange for stopover tickets at Denver.

ARRANGEMENTS FOR A SPECIAL AIRPLANE to take members West to San Francisco on Sunday, May 3, are being made.

SHOULD ANY GROUPS of members desire special trips while in California, Mr. Bretey will endeavor to make the arrangements for them.

A Million Dividend Checks

The American Telephone and Telegraph Company will mail its quarterly dividend checks the fifteenth of January to more than a million stockholders.

These are the people who own the wires, cables, switchboards, buildings and equipment that make your Bell telephone service possible. They are people in all walks of life, in every part of the country, who have invested their savings in the telephone business.

Since World War II the Bell System has spent more than six billion dollars to improve and extend the service. There are nearly fifteen million more telephones than six years ago. You can talk to more people – in more places – more quickly.

In these critical times, it is fortunate that the telephone industry could obtain the money needed to improve and extend the communication system which is so important to the armed forces, civil defense, office, factory and home.

The cost of providing telephone service is much higher than it was six years ago. Everyone knows how much wages, materials and taxes have gone up. But telephone rates haven't kept up with these increases in cost.

Your telephone company must charge enough for its service so that the rising cost of wages, taxes and materials can be met.

The public agencies that control telephone rates have over the years recognized this need for a financially strong telephone company able to perform its service well. It is essential that the company attract the investors whose money is required to keep on giving this country the best telephone service in the world.

BELL TELEPHONE SYSTEM

Modern Technology as an Aid in Reducing Operating Costs of Railroads

PIERRE R. BRETEY

UNTIL THE '20s, the railroad industry enjoyed a virtual monopoly in transportation. Notwithstanding the rapid development of the internal combustion engine in the '20s, with its threat to passenger and freight volumes, the railroad industry expended some $7.2 billion for capital expenditures from 1922 through 1930.

BESET WITH A HOST OF PROBLEMS

Beginning in the business decline of the early '30s, the industry was beset with a host of problems, primarily arising from unbridled and unregulated competition. This resulted in a drop in ton-mile rates from 1.08 cents in 1929 to 0.9 cent in 1937.

SERIES OF FINANCIAL PROBLEMS

Combinations of depression influences and lower ton-mile rates were reflected in a series of financial crises. For the industry, net earnings fell from $861 million in 1929 to an average of $36 million for the period 1931–40. Deficits after fixed charges were reported in 1932, 1933, 1934, and again in 1938. Then, numerous railroads sought refuge of the courts, and, at one time, railroads controlling over one-third of total United States mileage were in receivership. Such was the contraction of earning power of Class I railroads that capital expenditures declined from an average of some 800 million in the '20s to an average of $230 million in the '30s.

SOLVED PROBLEMS DURING WORLD WAR II

The Class I railroads temporarily "solved" their financial and operating problems during World War II. With competing transportation media throttled, railroad plant was used almost to capacity, earnings rose sharply, and finances were strengthened so that by the war's end, surplus funds were used to reduce debt by over $1 billion. Overall debt declined from $10 billion in the late '30s to $8 billion, the difference being accounted for through reorganization of a number of large carriers. Yet in spite of this drain on the industry's liquid funds, working capital rose from an average of $100 million in the late '30s to a year-end war peak of $2.25 billion and an average of $1.4 billion during the war years.

INVESTOR CONFIDENCE RESTORED

As a result of the industry's traffic and financial showing during the war, investor confidence at its termination in 1945 was almost entirely restored. Then, once again, forces beyond the control of railroad managements operated against the industry adversely. Railroad costs, sparked by inflationary developments, rose sharply. The price of fuel and of materials and supplies rose (base index 1935–39 = 100) from 103.4 in 1940 to 228.4 in early 1951, and wages from 104.7 to 248.1 in the same period, with hourly wages rising from $0.74 in 1940 to $1.76 in early 1951.

In addition to being subject to higher costs, with subsequent deterioration of competitive position, untoward results to the industry were compounded by failure of the regulatory bodies to adjust freight rates promptly as an offset to such rising costs. There accordingly ensued a phenomenon common to all regulated industries, an inevitable "squeeze" in profits, which scarcely provided an atmosphere conducive to re-establishing railroad credit to its once former high estate.

TWO CHOICES CONFRONTING THEM

Confronted with postwar realities, when Class I earnings, despite the depreciation of the dollar, averaged only $537 million (1946–50), compared with $746 million for the period 1922–29, and $678 million for the war period 1941–45, railroad managements had one of two choices confronting them, either: (1) attempting to influence public opinion to the end that subsidies granted to competing transportation media be either eliminated or greatly reduced, or (2) failing that, financing a large-scale major rehabilitation program to improve operating efficiency. A precedent for this latter had been established in the '20s, when, after World War I and the return of the railroads to private ownership in deplorable physical condition, expenditures of almost $8 billion, made within that decade, restored a large measure of the industry's previous efficiency. This made it possible for most of the larger Class I carriers to weather the economic storms of the '30s.

TRIED AND TESTED PROCEDURES

Fearing their inability to alter the existing unfavorable political climate, wherein the public was apathetic to the railroads' plea for abolishing subsidies, railroad managements turned to tried and tested precedents, and have invested, since 1947, $1 billion or more annually for capital expenditures, drawing in part on their accumulated cash funds for this purpose. That such a policy has been conducive to large operating savings over the years, and particularly in the past several years, is indicated by the trend of four significant indices as shown in Table 1, on next page.

FURTHER ILLUSTRATIONS OF INCREASED PROFICIENCY

Further illustrations of increased operating efficiency can be cited. Each serviceable freight car in 1950 traveled an average of 46.5 miles per day, an increase of 80.2% over the 1921 figure of 25.8 miles per day. Each freight car carried the equivalent of 972 tons of freight one mile, an increase of 116.9%, compared with 448 ton-miles per day in 1921. The average freight train in 1950 carried 1,224 tons per train, an 88.0% increase over the 1921 average of 651 tons. Lastly, each freight train in 1950 carried 20,344 tons of freight one mile, which compares with 7,506 tons in 1921, an increase of over 171%.

SAVINGS ACHIEVED THROUGH MODERNIZATION

These savings could only have been achieved through a comprehensive program of modernization and improvement, requiring an outlay of many billions of dollars. Such expenditures in turn depended largely on the financial health of the carriers, since there is a definite correlation of railroad expenditures (both for capital and maintenance accounts) with earning power and finances of the Class I carriers. This relationship is quite marked, as indicated by Table 2, on next page.

DO NOT IN GENERAL APPROVE CAPITAL EXPENDITURES

In preparing budget estimates, railroad officials do not in general approve capital expenditures unless those estimates show that economies of 20% to 25% can be earned on a particular investment. In many instances savings have exceeded those percentages. If it may be assumed that economies of only 20% per year have been realized on over-all capital expenditures of some $8 billion since 1940, then it can be shown that operating expenses of the Class I railroads at the end of 1950 were $1.6 billion less than they would otherwise have been. In the light of these over-all results, the public should be vitally interested in the adequacy of railroad earning power and in the state of Class I railroad finances, since these twin factors govern the rate of capital flow and potential economies realizable.

DIESEL POWER

In terms of actual dollars, not in percentages, the largest savings realized from capital investment over the past decade have accrued from installation of Diesel power as a substitute for older, less efficient steam power. The growth of Diesel power in the past decade has been phenomenal. Gross ton-miles of freight handled by Diesel power rose, from a negligible 0.22% in 1941, to 21% in 1948, to 35% in 1949, to 44% in 1950, and probably exceeded 50% in 1951. Passenger miles handled by Diesels rose, from 7.75% in 1941, to 39.5% in 1948, to 49.3% in 1949, to 57% in 1950, and well over 60% in 1951. Virtually all "crack" streamliners are hauled by Diesels. In yard service, use of Diesel switchers has been so accelerated that, in contrast to 12% of switching hours handled by this new form of power in 1941, the total came to 61% in 1950 and probably over 70% in 1951.

RETURN ON DIESEL POWER AVERAGES 30%

One large eastern carrier has estimated that return on investment in Diesel power is averaging 30%, although return on installation of additional Diesels will of necessity be somewhat less if the new power is used on secondary runs. An important southern carrier computes its savings from Diesel installations at 32%. Still another carrier estimates that substitution of 596 Diesel units for steam power provided savings of $34 million before taxes (almost 30% after taxes), an amount in subsequent years almost wiped out by rising wage, fuel, and material costs.

As of the end of 1950, the Class I railroads owned some 14,047 Diesel units, with an estimated 16,500 units at the end of 1951. If we calculate the cost of Diesels at $100 per horsepower, the Class I railroads, up to December 31, 1951, had invested over $2.25 billion in this form of power, direct annual savings on which probably exceeded $575 million. Total indirect benefits in the form of lower track maintenance, over-all efficiencies and the like, probably duplicated estimated direct savings.

SAVINGS NOT LIMITED TO NEW ADDITIONS

Substantial returns on capital outlays are not limited exclusively to installation of new power. In other instances savings from capital investment have been quite note-

Table 1. Measures of Performance of Class I Railroads

	Gross ton-miles (excluding Locomotive or tender) per freight-train-hour (a)	Net Tons per Train	Freight train speed (m.p.h. between terminals)	Locomotive miles per locomotive day (freight)
1921	16,555	651	11.5	78.2
1926	20,692	772	11.9	85.0
1929	24,539	804	13.2	91.2
1932	26,046	662	15.5	86.2
1936	29,200	774	15.8	105.2
1938	31,141	759	16.6	99.3
1940	33,811	849	16.7	107.5
1944	37,298	1,139	15.7	122.8
1946	37,057	1,086	16.0	115.9
1948	39,903	1,176	16.2	117.2
1949	42,346	1,138	16.9	113.4
1950	44,353	1,224	16.8	119.2

[a] Gross ton-miles per freight-train-hour, combining as they do volume and speed, are generally considered the best single all-inclusive index of physical operating efficiency.

worthy. In order to indicate the areas wherein the industry has benefited mostly from gross additions and betterments, we shall briefly analyze the experience of the railroads in recent years.

FREIGHT-TRAIN AND PASSENGER-TRAIN CARS

It is difficult to attribute specific savings to the installation of 600,854 freight-train and 5,254 passenger-train cars since 1940. These savings are doubtless greater than is generally realized since there has been relatively little heed taken of the technological progress recently made in freight-car manufacture. Most cars since the war have been built with capacities ranging from 50 to 70 tons, in marked contrast to predominantly 40-ton capacity prewar. The change has been so great that caution is suggested in interpreting carloading figures. When freight traffic is in a downward phase, carloadings show a greater decline than is actually occurring, since the more efficient and newer cars are kept in use. Contrariwise, when carloadings are increasing, smaller-capacity cars are returned in service, thus distorting the weekly statistics.

CENTRALIZED TRAFFIC CONTROL

As recently as a decade ago, there were relatively few miles of Class I railroad protected with centralized traffic control. As of January 1, 1951, however, there were, according to the ICC, 13,275 miles of road and 14,893 miles of track equipped with centralized traffic control. One smaller western carrier has installed centralized traffic control on virtually all of its main-line single track, and a major western system now has some 979 miles of centralized traffic control, of which 607 miles is continuous.

ANNUAL OPERATING EXPENSE INCREASED

With the advent of the 40-hour week late in 1949, annual operating expense for an open telegraph office, including wages, maintenance costs of building, etcetera, increased to around $15,000 annually. Through use of centralized traffic control, block offices and train order offices were eliminated. On 103 miles of single track on the Baltimore & Ohio between Grafton, W. Va., and Parkersburg, involving a capital outlay of some $800,000, annual payroll savings alone amounted to $180,000. Furthermore, benefits included increased track capacity, flexibility of train operations, faster passenger train speeds, and savings of a minute per mile for freight trains.

SAVINGS HAVE BEEN STRIKING

Savings from installation of centralized traffic control have in some instances been so striking that in the past year the Boston & Maine, the Erie, and the Milwaukee have converted, respectively, 22 miles, 57 miles, and 67 miles of double track to single track. Use of centralized traffic control with long sidings has made possible handling up to 30 trains daily.

COST OF TRACK CHANGES AND SIGNALS

Cost of track changes and signals on Erie's division between Buffalo and River Junction, N. Y., amounted to $500,920 with net salvage value estimated at $439,100. Salvage value of rail and ties consequently paid all but $62,000 of the capital costs of the project. Another significant feature was the estimated reduction of $92,000 in annual maintenance costs on this 57-mile segment.

MILWAUKEE RELEASED NO SPECIFIC STATISTICS

No specific statistics were released by the Milwaukee as to savings on its 67-mile segment between Green Island, Iowa, and Marion. However, both tracks were due for renewal, and cost of laying rail on one track amounted to $1.5 million less than it would have if rail had been needed on two tracks. Maintenance costs were thus halved.

OPERATING SAVINGS FROM CTC 35%

Operating savings resulting from the average single-track centralized traffic control installation have approximated

Table 2. Class I Railroads

	Net Earnings	Adjusted Working Capital*	Gross Additions & Betterments	Maintenance Accounts		
				Way and Structures	Equipment	Total Maintenance
	($ Million)	(000)				
1928	$786.8	$38,000 #	$676,665	$ 837,906	$1,166,942	$ 2,004,848
1929	896,8	26,439	853,721	855,355	1,202,912	2,058,267
1936	164.6	75,144(d)	298,991	454,810	782,999	1,237,809
1937	98.0	201,750(d)	509,793	495,594	826,709	1,322,303
1938	123.4(d)	139,171(d)	226,029	420,147	676,507	1,096,654
1939	93.2	51(d)	429,147	466,831	765,935	1,232,766
1942	901.7	755,162	534,897	796,358	1,211,037	2,007,395
1944	667.2	1,040,195	560,112	1,263,292	1,587,485	2,850,777
1946	287.1	1,256,674	561,957	1,150,241	1,468,758	2,618,999
1947	478.9	867,654	864,689	1,212,096	1,558,010	2,770,106
1948	698.0	754,779	1,273,484	1,347,997	1,702,940	3,050,936
1949	438.1	645,098	1,312,200	1,283,529	1,607,333	2,890,862
1950	783.6	805,890	1,065,842	1,287,266	1,707,934	2,995,000

* Adjusted by deducting material and supplies from current assets.
† Estimated.
d Deficit.

35%. The signal committee of the AAR reported one instance of savings of $402,430 on an investment of $925,270, or 53%. Running meets are frequently made in centralized traffic control territory, and such meets eliminate stops and consequent damage to merchandise through frequent train stops. ("Running meet" designates two trains passing each other in CTC territory—one train passing on a siding—without either being forced to stop.)

OTHER SIGNAL DEVICES

With operating expenses for manual control plants at crossings rising sharply, to well above $15,000 per employee, railroads have expended funds liberally, up to $100,000 per employee, to install automatic interlockings, remote controls of outlying interlockings, and also to consolidate control of two or more interlockings in terminal areas. Savings from such installations, without considering indirect economies in power, heat, and light, have exceeded 30% annually.

GATES AT GRADE CROSSINGS

Equally satisfactory savings are afforded in substituting gates at grade crossings. Cost of gates ranges from $5,000 to $20,000, depending on local conditions. One railroad located in a heavily populated area, and faced with the need of employing three men instead of two for a 24-hour grade crossing protection, installed 313 gates, with estimated savings of 37.5% on investment.

TRAIN TELEPHONE SYSTEMS

Some railroad managements are enthusiastic over the potential economies of radio and induction train telephone systems. Although there are no statistics of operating savings from use of these systems, the Erie spent an estimated $1.25 million for its 1,000-mile installation between Chicago and New York. On this railroad, phone conversations can now be held between locomotive cab and caboose, between two moving trains within radio range, between moving trains and wayside stations, and between adjacent wayside stations. Radio communication is also used to advantage in the operation of the Erie's classification yards.

ERIE HAS ALREADY BENEFITED MATERIALLY

The Erie has already benefited materially from its installation. Delays caused by broken drawbars, damaged knuckles, and unscheduled stops have been virtually eliminated. Elapsed time between division points has been lowered through expediting entrance and departure of trains at terminal and yard areas. Train telephones are also considered as an aid to safety supplementing economic benefits, for they can be used whenever trains are delayed or stalled, thus making for greater safety.

FURTHER ECONOMIES TO COME

Looking to the future, such savings as have already been achieved are but a harbinger of still further economies to come. A pioneer western railroad has been experimenting with substituting the radiotelephone for the telegraph in centralized traffic control territory for several years. Should these experiments prove successful, they would spell far greater efficiency of railroad operation, irrespective of whether individual stations were or were not manned by employees.

SMALLNESS OF ANTENNA LIMITING FACTOR

As yet, most of the radio experiments of this carrier have been in the nature of cab to caboose and/or to wayside stations. Limiting factor has been the relative smallness of the antenna which circumscribes the effective range of radio communication to a distance of only 21 miles. Over-all efficiencies would obviously result, were the train dispatcher able to talk to every train in centralized traffic control territory from his post at the CTC control station. Such communication would be possible, were there sufficient installations to permit communication by an engineer or conductor on a moving train with a wayside station, in turn connecting automatically with the train dispatcher.

TELEPHONE MAY SUPPLANT TELEGRAPH

Ultimately the telephone may supplant the telegraph in each railroad station, but only at such time as centralized traffic control will have been installed on the majority of the single-track main-line mileage in the United States and all trains equipped with cab-to-caboose train telephones. Only in such an event will it be possible for communication to be maintained at all times between trains and dispatchers, regardless of weather.

TWO DIFFICULTIES

Two difficulties face the universal acceptance of train communication on this scale; (1) the substantial investment necessary for installation of costly equipment on such a large scale, and (2) the acceptance by the Brotherhoods of the displacement of thousands of skilled workers. If the railroads can successfully hurdle these twin obstacles, potential economies will probably startle both the investor and public alike.

MECHANIZED EQUIPMENT

Machine Shops. One railroad operating in the West has achieved substantial economies, averaging over 50% on investment through use of new tools. A new clyinder boring tool has reduced the time previously required for one operation from 224 hours to 70 hours. A magnaglow inspection machine has made possible more accurate discovery of faults with axles. Through installation of a special device, this railroad was able to increase the number of cars painted in its own shops from 12 to 18 per day.

These experiences are typical of all Class I carriers. New equipment such as automatic-centering and precision-balancing machines should provide further savings by extending the life of all rotating parts, used primarily in Diesel engines. The surface has been barely scratched in economies to be obtained from wholesale modernization of railroad shops.

LCL Equipment. During the past several years, inflationary influences on the cost of moving less-than-carload-lot traffic have themselves been offset partially by revolutionary changes in handling such traffic. It is in this field that truck competition has been greatest. To retain this less-than-carload traffic, it has become necessary for railroads to remodel freight stations and transfer points, and at the same time install adequate numbers of both fork lift and platform tractor trucks. Efficiency of these new trucks has been largely increased through wide use of pallets.

LIST HAS MORE THAN DOUBLED

From 1948, the list of freight stations, transfers, and piers in which the railroads have installed mechanical equipment to handle unit loads has more than doubled. In 1951 alone, 148 fork lift trucks, 245 burden carriers, 49 tractors, 1,191 trailers, plus a large total of miscellaneous equipment, were put to use by 32 of the larger Class I carriers in handling both LCL and carload freight.

MORE ATTENTION TO LARGER TERMINALS

In the early stages of mechanization of freight terminals, railroad managements paid more attention to the larger terminals, where greater economies could be obtained. One railroad, in a three-year period, August 1945 through August 1948, increased the number of pounds of LCL handled per man-hour from 781 to 961. But, with handling costs constantly rising, many railroads are mechanizing even smaller stations with tonnages ranging from 75 to 150 per day. Last year, the Lackawanna completed one such installation at its Passaic, N. J., station, at which about 85 tons per day are handled. Union Pacific has mechanized all of its smaller stations, and the "Frisco" installed a pallet-fork lift operation in one of its 40-ton-capacity stations.

The railroads are now conferring with builders who believe that substitution of overhead belt conveyors would be conducive to sizable savings. Railroad management is hopeful that such a system can be devised as will provide for automatic shunting of packages from the main line of the conveyor belt to cars.

TRACK MAINTENANCE

Substitution of modern maintenance-of-way equipment probably offers to those carriers that have thus far failed to purchase modern machines greatest possible savings from capital investment. It has been estimated by competent authorities that 9,960 man-hours per $1,000 investment are saved annually by the use of spike-pulling machines, 7,330 man-hours from use of tie adzers, 6,529 man-hours from use of air spike drivers, and 11,212 man-hours from use of power jacks. On the basis of current wage rates, annual savings from the use of this equipment would range from $8,000 to $14,000 per $1,000 investment.

TAMPING MACHINES

In addition to cribbing and ballasting units, sizable savings are obtained by use of tamping machines. Studies compiled by a large railroad showed that cost of ballasting one mile of track on the basis of tamping 90 miles during a season was reduced from 2,059.2 man-hours (cost $1,806.23) to 928.6 man-hours (cost $842.45) by substituting a mechanical power ballaster for pneumatic hand tools. The railroad recovered its first cost in approximately nine months. Through purchase of three cribbing and tamping machines at a cost of $56,000 each, the Denver found that seven men could do an amount of work comparable to that formerly done by 165 men. First cost of these machines was recovered within six months. As individual railroads use a larger number of machines, however, more delays and idle time would somewhat reduce these savings. Yet, on an over-all basis, it is usually the rule rather than the exception for machines of this type to earn 100% on original investment in the first year.

SAVINGS NOT LIMITED TO THESE MACHINES

Track maintenance savings are not limited to these types of machines. Maintenance engineers are now using automobiles and trucks for transportation of men and materials to the jobs, as also off-track equipment; earth-moving equipment; and new adzing, boring, tie-pulling, and spiking machines, etcetera. Although much mechanization has already been effected, an average of some 9,200 machines having been purchased in each of the past five years at an over-all average cost of $19 million, greater use of tools is promised in the light of further potential economies achievable.

CLASSIFICATION YARDS

Modern railroad technologies have virtually outmoded older classification yards. Newer yards have humps, car retarders, train telephone communication systems, and longer tracks. One leading western railroad recently built two new classification yards, one costing $3 million with annual savings estimated in excess of $700,000, and the other costing $1.5 million with annual savings estimated at $600,000.

JOURNAL BOXES

The boxcar, basis of all railroading, has one fundamental weakness, namely, its journal box. Numerous attempts have been made to modernize the old type of journal because of its increasing failures, primarily due to waste grabs. Modern hump yard operations have tended to accentuate the waste grab problem. New methods of lubrication, and new rubber packaging have been proposed as a possible solution. If a new product is finally discovered and approved by the Class I carriers, capital investment may well exceed $500 million. An investment of only $200 per freight car would require an outlay of $350 million, since the industry's inventory of all types of cars currently amounts to 1,750,000 units.

SUBSTITUTE ROLLER FOR JOURNAL BEARINGS

Still another proposal has been made, to substitute roller bearings for journal bearings in all freight cars. Few qualified engineers will deny that the roller bearing is far superior in every respect to the obsolete-type journal bearing. Principal limiting factor of the roller bearing is its much higher cost. That, together with a per diem rate which is non-compensatory whenever the car is off-line, has slowed its general acceptance. However, in certain railroads that need special type of equipment to be used online, that is, not interchanged with connecting carriers, (Chesapeake & Ohio, coal cars; Atlantic Coast Line, phosphate cars), roller bearing have been installed. In all instances managements have been well pleased with over-all results.

Recently the chief engineer of the railroad division of Timken Roller Bearing Company read a paper before the American Society of Mechanical Engineers, well documented with impressive statistics, purporting to show that, if all freight cars on American railroads were equipped with roller bearings, capital investment of $871 million would be recovered through operating savings within a period of five years or less. To accelerate more general acceptance of the roller bearing, it would appear that a larger per diem rate would be necessary for all cars so equipped.

EFFECTUAL MODERN DEVICE A "MUST"

Whether the final solution is the roller bearing, or an equally acceptable substitute, a new more effective modern device is a "must" for the industry. It is an anomaly to have a technologically up-to-the-minute Diesel hauling a freight train whose cars are still equipped with antiquated journal bearings responsible all too frequently for serious wrecks.

MECHANIZATION OF OFFICE PROCEDURES

As in mechanization of LCL operations, some carriers have made much more progress than others in keeping abreast of modern developments in the accounting field. One large eastern railroad has made considerable advancements in modernizing its accounting operations. On the basis of its estimates, after allowing for rental costs of machines, depreciation, interest, and the like, savings of 20% on original investment have been indicated. As yet, too few carriers have mechanized to the extent of this particular road, but intelligent study will doubtless disclose potentialities of large savings by other roads installing mechanized equipment in their accounting operations.

OTHER DEVICES

Space limits discussion of the use of welded rail, still in its controversial stage, grouting (forced injection of a cement asphalt mix to eliminate water underlying track structure, thus stabilizing an otherwise dangerous track condition), use of treated wood for ties, bridges, new types of snow plows, new devices for snow removal in yards, such as electric snow melters for switches, and so on. Worthwhile savings from use of such devices have been obtained by railroads in the past, and further savings are possible through more intensive use of such devices as have just been mentioned.

SPECIAL CARS

In recent years there have been developed a number of specialty cars, such as the Evans auto loader, the air-activated container, the compartmentalized car, and the all-wood-laminated car. And a specially designed LCL container, the Missouri Pacific's "Speedbox," has been developed. Each of these units possesses advantages. Particularly satisfactory savings should accrue through reduction of freight claims by use of the "compartmentizer" car. However, no railroad has, as yet, seen fit to release statistics furnishing a clue to the relative profitability of any one particular type of car.

MECHANICAL REFRIGERATOR CAR

Large savings are conceivable from the substitution of the mechanical refrigerator car for the older type of car, refrigerated with ice. The Bellows Falls Co-operative Creamery, first milk company to use a mechanized refrigerator car to ship dairy products on a Class I railroad, reduced its operating costs from $25,000 monthly for ice to $500 for gas and oil. No mechanical failures were reported from May 1951, date of installation, to December of that year.

WESTERN FRUIT EXPRESS

Great Northern's subsidiary, the Western Fruit Express, has experimented with a mechanical refrigerator car in shipping apples to the East from Washington, with exceptionally profitable results. Other railroads have also been experimenting with these mechanized units. Fruit Growers Express has purchased some 100 units, and the Santa Fe is planning to build 30 new mechanized "reefers" in its shops.

COMPLETE MECHANIZATION APPEARS UNLIKELY

However economical, complete mechanization of all refrigerator cars appears unlikely, since some agricultural produce, such as melons and lettuce, require crushed ice during shipment, to insure proper condition on arrival at destination. Icing needs of these products would complicate shipping train loads of refrigerator cars, since no railroad could handle a train economically with a mixed consist of both mechanized and non-mechanized refrigerator cars. In that case, while the non-mechanized cars are being iced, advantages of the mechanical cars would be lost.

SAVINGS

Yet, while the problem is admittedly complex, potential savings are so enormous that substitution, over a period of years, of well over 75% of non-mechanical cars for those equipped with mechanical units seems assured, despite combination of large investment outlays and capital losses from abandonment of icing facilities.

NEW LINES

At a time when competition of the passenger car and the truck is gradually forcing abandonment of light-density mileage, certain railroads are spending large sums to rebuild their main lines. The Burlington is spending some $16 million on a Missouri cutoff, shortening its Chicago–Kansas City line by 22 miles, and the Rock Island is spending some $7 million for a line change in western Iowa. This latter expenditure is part of a $40 million program, inaugurated a decade ago, to reduce grades, straighten curves, and strengthen bridges, so that Rock Island's freight trains need not slow down nor reduce tonnages because of grades.

UNION PACIFIC

The Union Pacific is planning a new 42-mile segment between Cheyenne and Dale Creek in southeastern Wyoming, at a cost of $16 million. The new route will eliminate the heavy upward pull out of Cheyenne to the summit of Sherman Hill, 8,014 feet high, highest point on Union Pacific. The present westbound track has a maximum grade of 1.55%, compared to a maximum grade of 0.82% for the new line. Although nine miles longer, the lower grade will make possible train-running time savings of 15 minutes because of the reduced grade.

Expenditures for new lines justify themselves in faster freight schedules, lower maintenance costs, and greater operating efficiencies. The new Burlington and Rock Island lines should make possible savings of two hours per freight train operated.

SPECIAL SERVICES

Most railroads have co-ordinated truck facilities to haul LCL shipments from large break-bulk centers to smaller communities, thus eliminating the costly way freight. However, the ICC has not been too liberal in allowing railroads freedom of action in their trucking operations. More freedom should be allowed the carriers in operating trucks, for, unless greater flexibility is allowed, railroads will still suffer operating losses on short-haul freight, although admittedly less than if railroads were to continue operating way or peddler freights, and as a consequence inferior service will be provided to the public.

SUPPLEMENTARY TRUCKING SERVICES

Flexible services are usually profitable of themselves, even without the savings from elimination of way freight losses being taken into account. In 1948, before being forced, under ICC orders, to strip itself of some operations, the Texas & Pacific Motor Transit Company, which paralleled the entire railroad system and operated more route miles than did the railroad proper, earned a net income of $119,000 before taxes.

Substantial operating results could ensue, were the railroads permitted to operate flexible trucking operations, for, in that way, a number of unprofitable operations could be eliminated.

COSTS MUST BE REDUCED FURTHER

Much, of course, remains to be done in these and in other fields to reduce costs further. It has been estimated by competent authorities that, to effect complete modernization of the Class I railroads, some $15 billion of capital expenditures are still required: $4 billion for new Diesel or gas turbine locomotives, the latter type now in its development stage; $2 billion for replacement of 20,000 antiquated passenger cars; $4 billion for replacement of 700,000 obsolete freight cars with those of larger tonnages, equipped with new easy riding trucks, and $5 billion for improvement of grades and of roadbeds, for modernizing classification yards, for complete mechanization of all track work and freight houses in its LCL operations, and, lastly, for extension of modern signal devices, including additional centralized traffic control and radio communication.

REHABILITATION JOB TREMENDOUS

This represents an even greater rehabilitation job than that effected by the carriers both in the 1920's and since V-J Day. Present-day technologies point to the need of spending at least $10 billion of the necessary $15 billion in the current decade, especially as a railroad is a living organization, that is never completed, and must be constantly rebuilt through employment of the most modern technologies. Still more funds will be needed in each succeeding decade until such time, if ever it should occur, as the railroads follow the canal and the horse down the path of economic obsolescence.

CONCLUSION

However important the savings from capital investments have been, and are likely to be, and however necessary for the railroad industry to keep abreast of technological developments to provide improved service to the public, complete objectivity compels the following concluding observation, lest it be thought that the railroad problem may be solved solely through large-scale expenditures for additions and betterments.

RAILROADS ARE REGULATED

Today the railroads are regulated just as though they still enjoyed a transportation monopoly. If the United States persists, as it has since the mid-'30s, in adhering to the economic tenets of Keynes, with emphasis upon full employment and consequent inflationary implications, the position of the railroads, under conditions of strict regulation, would indeed be untenable. However, at long last, there are signs that a new regulatory day is dawning. The so-called Bricker Report, "Senate Resolution 50," has recommended that the rails be permitted greater managerial flexibility with regard to adjustment of rates and elimination of unprofitable services, including abandonment of branch lines. Although not specifically mentioned, it seems probable that railroads may be allowed to operate supplementary trucking services without presently unfair prohibitions now prescribed by the Commission.

CHANGE IN TAXING PHILOSOPHY

An essential requirement for a healthier competitive situation is a change in the taxing philosophy on the part of governmental authorities. In a study prepared for THE ANALYSTS JOURNAL (Volume 7, Number 1), it was indicated that, in the past decade or more, railroads have become fair game for the tax collector. As a consequence, taxes were absorbing an ever-increasing percentage of railroads' earnings. Even the Brotherhoods cannot be absolved from criticism in this development, since they employ their economic power to force the railroads to contribute ever larger percentages of their gross revenues for unemployment and pension benefits. The roads average higher social betterment funds than any other major industry in the United States.

In some instances, taxes have advanced beyond the point of diminishing returns, as witness the now defunct Boston & Westchester. The demise of this commutation railroad resulted from the failure of the communities it served to reduce taxes adequately. A similar fate may well befall the Long Island, unless reorganization proposals providing for operation, tax-free, by a public authority can sustain that road.

Thus it is that scientific innovations and the progress emanating from inventions make possible large savings in railroad operations. Are they to be rendered worthless by ill-considered taxation and imprudent Keynesian legislation?

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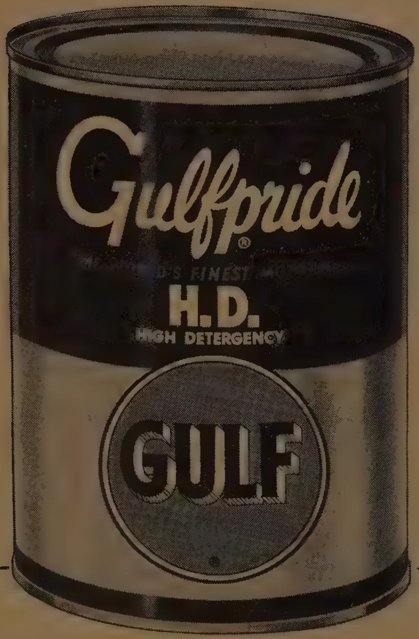

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Research in Steel

R. E. ZIMMERMAN

IT WILL NEVER BE FINISHED. Research in steel is necessarily a continuing activity, because it deals with a basic requirement of our modern civilization, and we must maintain our foundations in prime condition. Year after year, this capital goods industry must adjust its processes and products to keep in step with progress and meet the needs of the times. Only by determined searching and probing, leading to discovery and improvement, can steel be kept in position to serve so well the manifold purposes for which it should be fitted, either in the arts of peace or the rigors of National Defense. Such is the task of research.

COUNTLESS USES FOR STEEL

Everybody knows that there are countless uses for steel, thousands and thousands of uses. Regardless of such numbers and the diversification that necessarily attends them, the consuming public has been taught to expect that the most suitable material will be developed and used in each and every application. Misfits are not to be countenanced, not for long. For an extreme example, you, as a member of the consuming public, would not shave comfortably with a razor blade made of tin plate, and certainly razor blade steel would not take much of a prize for performance in the normal operations of the can-making industry. Neither would a bridge engineer base his design on rail steel, or an automobile manufacturer produce passenger-car bodies from material suitable for springs, or gears, or bumpers. Do you think that bobby pins of even slightly improper temper would long be tolerated by the temper which lies beneath them, or that your car would be supplied unfailingly with gasoline if random grades of steel were used for drill pipe in the oil fields? Of course not. Let us not pursue this line of inquiry until someone who has not been paying attention asks whether there is anything special about the alloy steels used in parts of gas turbines or jet engines, or in the cores of electric transformers, or the electrodes used in brain surgery.

WHEN RESEARCH IN STEEL INITIATED

No one knows exactly when research in steel was initiated. Iron and steel have come down to us through many centuries of history, through ages of comparatively slow progress and improvement. There were, however, some remarkable specimens of steel laboriously produced long before the modern era of rapid development. The daggers of ancient Japan are still sources of wonderment, and the swords of Damascus, along with the famous Toledo blades, are mentioned with awe. Those were the good old days of miraculous quality in steel, although the poundage was inconsequential! Why do we not produce the equivalent of this fabulous ancient steel now? We do, by hundreds and thousands of tons. Commercial research, however, has informed us that the market for swords is narrowly restricted; hence, the important tonnages of modern steels are used for other purposes. Fortunately the methods of production are vastly improved, so that the prices are reasonable. Were we obliged to resort to the practices by which the steel for the ancient swords was painstakingly and repeatedly hammered out, and to employ hand labor at the currently prevailing hourly rates, it is estimated that the cost per Damascine sword fob, U.S.A. would range from $9,000.85 to $27,000.85, the 85 cents being the present cost of the steel used.

HARDLY ONE HUNDRED YEARS OLD

The modern steel industry is hardly a hundred years old. It is generally considered as dating from the 1860's, when the pneumatic method of refining molten iron was developed by Bessemer in England and independently by Kelley in the United States. That method produced what is commonly called Bessemer steel and could do it rapidly in comparatively large quantities. Approximately ten years later the open-hearth process was under way, using as its metallic charge both molten iron and, significantly, large proportions of steel scrap. The two methods operated side by side for many years in the expanding American steel industry, the Bessemer gradually yielding ground to the open hearth, until now the latter produces about 90% of the steel in this country.

SUBJECT OF STUDY AND EXPERIMENTATION

During the latter half of the nineteenth century and the early years of the twentieth, steel making was the subject of much study and experimentation. A number of notable engineers, along with a complement of chemists, metallurgists, and experienced industrialists, made numerous important contributions to the advancement of processes, equipment, and products of the steel industry. There is no doubt that research was involved in these measures, but the efforts were not formally designated as such, nor was research, along with its companion, development, set out as the responsbility of a separately organized department. The widespread activity we now call industrial research had not quite crystallized in the steel industry, although science and operations were therein becoming more closely associated, on ever-broader planes. Additional laboratories were provided to deal with the technology of steel production, its mechanical shaping and treatment, and the problems of its utilization. Then a few years prior to the first World War, the thing happened—research organizations and research laboratories, designated as such, began to operate with definitely defined responsibilities in parts of the steel industry.

MOVEMENT GATHERED MOMENTUM

Throughout subsequent years the research movement in steel gathered momentum and spread, so that now it is a standard activity in this field. There are good reasons why it should be so, and why it should continue indefinitely.

Industry found that the scientific approach was most effective in solving many of its troublesome problems, in providing answers to vexing questions, in laying foundations for the development of new products, and in providing increased efficiencies in process after process. It devised and maintained technological controls, making for economies, reproducibility of results, and higher quality. Answers to why and how, formerly obscure, were often laid out on the table, for the benefit of operators and officials. Competition within the industry prescribed that, if one company was experiencing such benefits, the others likewise must be equipped to realize them. So research flourished in many quarters.

ALERT AND PROGRESSIVE CUSTOMERS

Another important urge to the prosecution of research was the fact that the steel industry constantly was dealing with a long list of alert and progressive customers, many of whom were thriving on their own research, devising new products, using new techniques and demanding grades of steel particularly adapted to their requirements. This situation had to be met in the past, it is with us now, and it will continue into the future. More and more products are being made of steel, and performances are being demanded that would have been the despair of the old-time industry. It is just unthinkable that the steel industry could have survived and prospered, asleep, while its far-sighted customers were preparing to march ahead in the fast moving industrial procession. They had to go forward together, and did.

WHAT HAS BEEN TRANSPIRING

Does the layman know or care what has been transpiring in the steel industry since research became a factor in its activities? Of course, he knows in part, and cares more, because steel affects his daily life in so many ways. But he would not be willing to read a comprehensive treatise, setting forth a catalog of results, compiled by a metallurgist, and presented in technical phraseology. Therefore, the reader will not be asked to undergo such an ordeal here and now. The citation of a few examples, however, not necessarily labeled "well chosen," will at least add substance to the general statements made heretofore, and so furnish chapter, if not verse.

FUTURE SUPPLY OF IRON ORE

Everybody has been wondering what the American steel industry is going to do about a future supply of iron ore, in view of the apparent fact that accelerated annual consumption has eaten seriously into the high-grade deposits of the Lake Superior region. Incidentally, that area has been the mainstay of our domestic iron ore supply.

The problem is being attacked in two ways. In the first place, some excellent deposits of iron ore are being developed in foreign countries. That is reasonable and wise. But there is another string to the bow, involving lower-grade deposits right here in the United States. Research has been working intensively to develop economical methods for concentrating these lower-grade materials, so that they may be used advantageously in our blast furnaces or reducing apparatus, as a primary source of iron. Logically enough, the research workers have been devoting attention first to a potential 75 billion tons of intermediate-grade ore, but they also have been devising measures for the subsequent concentration and utilization of the really lean grades, of which the Lake Superior region apparently holds something in excess of 350 billion tons. In good American jargon, we are not "fresh out of iron ore." The research work on this problem is sufficiently well advanced to warrant the statement that the United States could not be critically imperiled because of the lack of an adequate domestic supply of iron ore.

METALLURGICAL RESEARCH

Metallurgical research likewise has done a tremendous job in the field of the alloy steels, and is continuing to render outstanding service in that sector of the steel business. There are hundreds of grades or varieties of alloy steel, due to the avialability of numerous alloying elements, such as manganese, nickel, chromium, molybdenum, and vanadium. These addition agents may be added singly or in combination to steels of various carbon contents, thus making for the possibility of almost infinite diversification. Different alloying elements confer different properties on the steel, or emphasize certain desired physical characteristics such as strength, hardness, ductility, resistance to wear, impact, or deterioration at elevated temperatures. Years ago the development of an alloy steel to meet a set of specified requirements was a matter of cut and try, involving a formidable amount of experimentation. Long and comprehensive scientific research into the effects of the alloying elements in steel resulted in the building of a usable philosophy of alloying, so that the metallurgist now knows in which direction to turn to fill a prescription for any reasonable (and some unreasonable) requirements demanded of steel.

HEAT TREATMENT

Heat treatment goes hand in hand with chemical composition. Equally systematic and comprehensive research into the effects of various heat treatments on the carbon and alloy steels has set a definite pattern for obtaining the product or products best adapted to the job in question. Hence the advanced position of American industries using steel as one of their important basic materials; hence also the abundance of excellent consumer products widely available at reasonable prices.

STRATEGIC VALUE DURING WAR

Continual benefits are being derived from these metallurgical researches, but we should point out their special strategic value during the Second World War. In that period the supply of alloying elements was running low; most of them were produced from ores imported from distant countries. What to do? American metallurgists, making use of the vast fund of information immediately at hand because of prior research, quickly devised the series of National Emergency steels which saved the situation. Small quantities of combinations of the alloying elements were used, instead of higher percentages of one or two, and these proved effective in providing the properties desired.

Now again, with the development of another period of scarcity, research has brought forward its perfected method of adding very small quantities of boron to alloy steels, further reducing the amounts of critical elements required, and once more promising to save the day. Without these measures, we might be sadly at a loss to furnish, in full effectiveness, the kinds of steel needed in the defense effort and in the civilian economy. So, come times of stress, we are much less apprehensive than heretofore.

ANOTHER MAJOR SERVICE

Mention of critical metals and scarcities brings to mind another major service that research has performed in recent years. A newly devised process for coating tin plate electrolytically is the subject. Although much of the development work was done before we became involved in World War II, the process was a noteworthy help to the national economy and welfare when our supplies of metallic tin were seriously curtailed by military action. Because the process stretched one pound of tin into more than two, sufficient tin plate could be produced to meet the requirements of the military food supply, and leave enough for use in servicing the civilian population. Electrolytic tinning is not primarily a war baby or war measure; it is now the leading method for the production of tin plate in the United States and is spreading throughout the industrial world. It is a monument to organized scientific and industrial research.

ENGAGED IN SOLVING PROBLEMS

In practically every sector of the steel business, research has been engaged in solving problems and has devoted much attention to determining the most advantageous applications of steel to the multifold needs of the consuming trade. In both variety and number of problems, in the study of which immense benefits have accrued, the list of subjects is more than one brief thesis can bear, but the foregoing illustrations will be augmented by the laconic mention of a few more:

1. The proper preparation and sizing of materials for the operation of blast furnaces.
2. Practical operation of the high-pressure blast furnace process.
3. Alignment of open-hearth steel-making practice to conform with scientific principles governing the operation.
4. Development of the continuous hot rolling and subsequent cold reduction of strip-sheet steel.
5. New methods of annealing and heat-treating different varieties of steel, to emphasize at will certain selected physical properties for specified requirements.
6. Development and perfection of the stainless steels, the jewelry items of the steel business. A new member of this family has contributed importantly to the production of large television tubes.
7. Production of steels especially adapted for use by the processing industries—steels that withstand service at elevated temperatures, and, on the other hand, those that do not become brittle at temperatures far below zero. Your grandfather could not buy such steels, but he did not need them. Your grandson will need them just as you do, only more so, and they are available.
8. Improvement of the special alloy steels used in electric transformers. This research alone has been saving hundreds of millions of dollars annually for the consumers of electric power.
9. A hundred additional interesting items, if you only had the time to read about them!

RETURNS ARE HIGH

Well, all of this research costs a lot of money, but the returns are so high that no one, with a rational program of research, begrudges the expenditure. The over-all benefits can readily be demonstrated. Generous capital outlays must go hand in hand with research, in order that it may bear fruit; the fruit, however, is picked and enjoyed not only by the stockholders, but bountifully by the employees and the consuming public as well. Economies in operation and the development of new well-fitting products contribute importantly to the possibility of high wages, improved quality, reasonable prices, continual progress, and national security. In fact, the last final margin of technical superiority in the total industrial organization of any country, developed under a system of private competitive enterprise, unfettered and unafraid, may well be a leading factor in determining the position that country can maintain in world affairs.

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Utilization of Population Centers as Investment Wells

JOSEPH S. DAVIS

VITAL STATISTICS are vital for analysts—never more so than now in the United States, for shifts and growths of population alter consumption and investment centers.

FAILED TO CONFORM TO TRENDS

Births, deaths, and net in-migrants have stubbornly failed, for more than a decade and especially since 1947, to conform to "trends" confidently projected by the foremost experts. Our population and its age distribution differ radically from what we had been led to expect. The contrasts between forecasts and actual developments were impressive during World War II, striking in the first five postwar years, and startling in 1951. The net results are of profound significance for business, economic, and social analyses.

Many competent American analysts are doubtless awake to recent demographic facts and their far-reaching implications. But there is a serious lag in unlearning wrong ideas that are deeply imbedded in all but very recent literature—and in much of that. The population specialists have been slow to admit how far wrong their generalizations and forecasts have been., and prone to keep silent until new evidence becomes overwhelmingly convincing. Under these circumstances, it is urgent that other social scientists and analysts not only get a full understanding of the available facts but also adopt the too uncommon practice of keeping up with current data on births, deaths, age distribution, and migrations. Witness the increasing numbers of brokers and analysts in the West and Southwest.

PROFESSORS OF THE FUTURE

William Ogburn recently suggested that our professors of history might well have their counterparts in professors of the future, who would devote themselves to studies of trends. The suggestion has merit. But America's recent population developments have proved some of the most refined trend analysis quite unreliable, and methods of trend analysis crudely employing inappropriate statistical formulas are still in wide use. Analysts must do far better if they are not to be discredited, and sound appraisals of population developments have basic importance for their work. Rich districts consume, buy, and invest.

Edwin Cannan, writing in 1931, voiced the opinion "that the biggest change made in economic theory during the last hundred years is to be found in the treatment of population." The economic history of 1831 to 1931, he said, had "tended to bring about a very complete reversal" of economists' views on several pertinent points. "We set no bounds to the possibilities of improvement" in agricultural output, which seemed limited to Malthus and J. S. Mill. And "we do not now expect rapid increase of population to continue much longer, even if it becomes progressively easier to obtain subsistence."*

The last view had gained ground in the 1920's and became dominant in the 1930's, not only in respect to the United Kingdom and Western Europe but also in respect to the United States, Canada, and Australia. Able and representative American demographers, sociologists, statisticians, and economists agreed that the United States was "in the midst of a drastic decline in the rate of population growth . . . with the prospect of actual contraction confronting us"—constituting a "revolutionary change" of overwhelming significance. These views persisted through World War II. They were given fresh if slightly modified expression in *Forecasts of the Population of the United States* 1945–1975, published by the Bureau of the Census late in 1947.

SUCH VIEWS DESERVE NO CREDENCE

Now, only four years later, such views deserve no credence. A sustained postwar flood of births, together with notable improvement in mortality experience and appreciable contributions from net in-migration, has raised our population to a figure (155,356,000 as of November 1, 1951) that would have seemed utterly incredible to the President's Committee on Social Trends (1933), the National Resources Committee (1938), and the experts of the Scripps Foundation and the Census Bureau as late as four years ago. Indeed, our present population is within 10 million of the all-time peak forecast for 1990 (164.6 million) in the Census Bureau release of mid-September 1946, which was not disavowed until mid-1950.

Our population outlook, it is now safe to say, has undergone another revolutionary reversal. Accumulating data leave no room for doubt that "population trends" in this country have been seriously misinterpreted and the future growth radically underestimated. No peak population, of any size, is in sight or safely predictable for any date. Indeed, the very foundations of the conviction that our population growth "must stop some time" have crumbled. Whatever the distant future may hold, the United States is practically assured of substantial population growth in the calculable future—in the absence of catastrophes far greater than World War II. The rate of growth will vary from decade to decade, probably to a degree not hitherto expected. In terms of half-centuries the long-term decline in rate of growth bids fair to continue. But the percentage

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*Edwin Cannan, The Changed Outlook in Regard to Population, 1831–1931, *Economic Journal*, volume XLI, December 1931, pages 519–33, especially pages 520–21.

increase in the next half-century will be far higher than any of the trusted projections of 1920–49 had shown.

Net in-migration (including American citizens from abroad and from insular territories, chiefly Puerto Rico) since 1940 has been much larger than any of the favored population projections assumed. According to Shryock, "Net civilian immigration from abroad [in the 1940's] was only 305,000 up to the middle of the war but 1,600,000 for the whole decade."[†] The Census Bureau forecast of February 1949 assumed a total of 1 million in the *eight* years ending July 1, 1955. The actual total in the first three of these years was nearly 1 million.

DEATH RATE CONTINUES TO FALL

Despite hazards attending the flood of births, and the notable increase in the numbers in the upper age groups, the crude death rate has continued to fall (it is now under 10 per 1,000), the annual number of deaths has shown only a slight uptrend since 1910 (the 1947–50 average is 1.45 million), and the age-adjusted death rate continues its long-term decline. In the next forty years, the annual number of deaths can be expected to rise considerably, because of increasingly large numbers in the higher age groups, but we have no basis for forecasting the rate of increase. Dublin and Spiegelman even say that "no serious student of mortality would guess when the death rate would reach a minimum and what it would be."[‡] The 1950 census returns indicated a population aged 65 years and over fully 1 million (9%) higher than the Census Bureau's forecast of mid-September 1946. A recent study by Metropolitan Life specialists shows that, in this age group, mortality among industrial policy holders fell by one eighth in the first five postwar years. "Even at ages 65–74 years, the death rate for males fell by more than one quarter and for females by one third."[‡] There have been a notable rise in life expectancy at birth and significant increases even in the upper age groups. The survivors of the babies born in 1947–51 to ages 20, 30, 50, and 70 will be far more numerous, relatively as well as absolutely, than the survivors (at comparable ages) of those born in 1920–24.

LARGE NUMBERS OF BIRTHS

Of outstanding significance, however, has been the extraordinary continuance of large numbers of births since the end of World War II. One of the firmest convictions of the demographers, which they have been most loath to abandon, was that the huge number of births in 1946–47 would prove a "flash in the pan"—in other words, that the "baby boom" would be followed by a "bust." Rapid demobilization following the end of hostilities boosted marriages and then births, which reached 4,025,000 in the 12 months ending August 1947. This was far higher than the experts had expected, but they were sure that it would be followed by an abrupt and persistent decline, probably to or below the level of the 1930's, after which the prewar downtrend would be resumed. No such drop has yet begun. The actual decline was both moderate and short-lived. The lowest 12-month totals since 1946–47 have not been much below 3.7 million. The latest, for the 12 months ending October 1951, is 3,889,000—a figure exceeded only in the corresponding periods ending with May through November 1947.

RISING EVER SINCE 1937

Five-year moving totals of births have been rising ever since 1937. At their prewar peaks in 1914–18 and 1920–24, birth totals approached 14.8 million, and a calendar-year record of 3,055,000 was reached in 1921. The interwar low total in 1933–37 was 11.85 million, and a low of 2,307,000 was reached in 1933. The postwar peak total of 1947–51 will approach 19 million, and 1951 births will move to exceed the standing calendar-year record of 3,876,000 in 1947. These unprecedentedly wide swings in births will have their echoes in waves of different age groups through the coming decades.

ILLUSTRATIVE PROJECTIONS

In mid-1950 the Census Bureau replaced its first and second postwar population "forecasts" by three "illustrative projections" to 1960, for each of which it gave a series of projected births.[§] But the Bureau wisely warned that births cannot be reliably predicted and that none of the projections should be taken as a dependable forecast, even for the decade 1950–60. It is still reasonable to expect a slump in births in the 1950's, but the timing and extent cannot be estimated by any devices yet available. My own "guesstimate"—it is nothing more—is that the curve of births in this decade will follow a course mostly between the Bureau's high and medium series, but closely resembling neither.

Whatever the trough of births may be in the 1950's, we can now reasonably count upon an even larger flood of births in the decade or so centering about 1975, with transitional increases in the 1960's. The number of women in the most fertile age groups in the 1970's will be probably about 50% larger than in recent postwar years, instead of only slightly larger, as demographers projected on the assumption of a sharp decline of births after 1947. Economic conditions and social attitudes in the 1970's will of course influence the curves of marriages and births. But it would require a striking reduction in fertility, which we now have no basis for projecting, to offset the marked increase in potential mothers.

Because of extreme uncertainty about levels and course of births in the years and decades ahead, projections of the total population are subject to an especially wide margin of error. But far too little use is yet made of the less unreliable projections of age groups already born. The Census Bureau can, if sufficiently urged, supply more complete and more frequently revised estimates of our future population by age and sex, exclusive of those in age groups not yet born. Scientific utilization of such data already published can contribute much to the improvement of forecasts of demand for important commodities, for specific types of investment, and for consumption and investment as a whole. One need mention only milk, cigarettes, toys, engagement rings, layettes, and schools of various grades, to suggest important applications of this rich mine of population material. The predictable population developments in prospect have profound importance for the analysis of industries and securities.

[†] H. S. Shryock, Jr., Redistribution of Population: 1940 to 1950, *Journal American Statistical Association*, volume XLVI, December 1951, page 429.

[‡] Louis Dublin and Mortimer Spiegelman, Health Progress among Industrial Policyholders, 1946 to 1950, *Society of Actuaries Transactions*, volume III, September 1951, pages 294–328, especially page 296.

[§] J. M. Keynes, Some Economic Consequences of a Declining Population, *Eugenics Review* (London), volume XXXIX, April 1937, pages 13–17.

NUMBER OF CHILDREN UNDER 5

Apart from the postwar flood of births, but largely as a consequence of it, the most striking upset of the demographers' convictions has been the rise in the number of children under 5. A continuance of the downtrend of the 1920's and 1930's was firmly expected, and elementary school enrollment a decade ago was believed to have permanently passed its peak. Now it appears certain that this enrollment will be 25 to 30% above that peak around 1960, and some 50% above the low of the mid-1940's. Moreover, whereas it was confidently expected that children under 5 would constitute a continually declining fraction of the total population, this fraction has been rising for more than a decade.

It is not yet sufficiently realized that the unprecedented crop of babies since 1940, coupled with the low rates of infant and child mortality, insures rising volumes of needs and wants as these children grow into their teens and twenties. This important mainspring of greatly enlarged demand is assured, and it is vastly larger than was conceived possible five, ten, or fifteen years ago. Another mainspring consists in the notable advance in the consumption *standards* (as distinct from consumption levels) of the masses of the American people. These have risen at a far more rapid rate than Keynes in 1937 considered at all reasonable to expect.[11] The investment requirements for a people growing not only in numbers but also in age are radically higher than economists or analysts expected, in their reliance upon now obsolete population forecasts. Whatever ups and downs in business we must expect, there is far less ground for fear of failure of aggregate demand than some leading American economists have confidently supposed.

Although we lack reliable bases for forecasting our total population 25 to 50 years hence, there is now good reason to expect that it will considerably exceed 200 million by the year 2000, and that this figure may even be passed by 1980. This is a wholly different picture from the one that has been widely envisaged. And the prospective waves of more and less rapid growth must be reckoned with in all scientific analyses.

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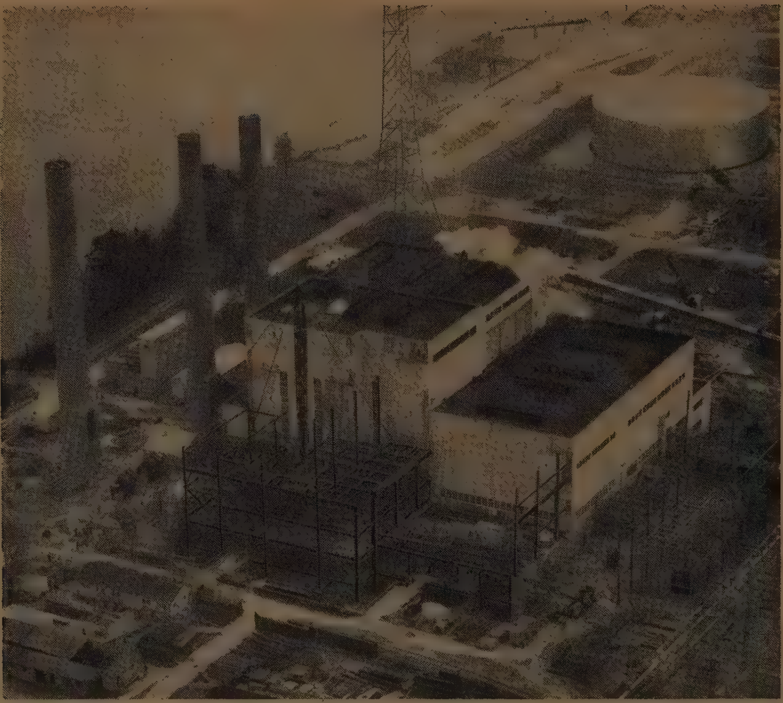
[11] Bureau of the Census, *Current Population Reports,* series P–25, number 43, August 10, 1950. These were later "unofficially" extended to 1975 by Margaret J. Hagood and Jacob S. Siegel, *Agricultural Economic Research,* volume III, April 1951, pages 41–52.

* * *

The iron business is a very uncertain trade for persons to engage in who are not acquainted with the number of years in which the price advances, as they are only from two to four years, while the declines are from five to seven years.
Benner's Prophecies, 1884

When a man wants correct advice in law, he goes to a professional lawyer in good standing. . . . Professional advice in Wall Street, as in legal affairs, is worth paying for, and costs far less in the end than the cheap "points" that are distributed profusely around the Street.
Henry Clews

1855 . . . The United States Government imported camels from Egypt. Thirty-three camels came to this country for mail carrying in Texas. On the way another was born, giving the Government an unlooked-for dividend. Another shipment arrived the following year. The cost was $30,000. It was found that no use could be made of them, so they were abandoned, strayed, died, or were killed, leaving the Treasury with a loss, the result of a thoughtless enterprise.
Report of the Secretary of War



CHESTERFIELD steam station showing new 91,000 Kw. addition now under construction for completion this summer, which will give this station a name-plate rated capacity of over 200,000 Kw.

BUILDING AHEAD!

Construction work . . . new power stations, additions to present stations, miles of transmission lines and distribution lines to serve new customers . . . can be seen going up all over the Vepco System serving most of Virginia and parts of North Carolina and West Virginia . . . *have* been going up since the close of the war. Over this five-year period, 1946–51, Vepco has spent about $170,000,000 on additions to generating and transmission facilities and distribution lines to serve new customers. It has increased its generating capacity 75% and when present construction under way is completed in 1952, its generating capacity will be more than double that of 1946.

During this same 5-year period—

Operating revenues increased from $40,259,000 to over $69,000,000, or 67%;

The number of customers served increased from 374,565 to 546,000, or 45%;

The peak load increased from 455,700 to 804,000 kilowatts, or 76%;

Electric sales—thousands of kilowatt-hours—increased from 1,917,000 to 3,460,000, or 80%;

The average annual use per residential customer increased from 1,452 to over 2,200 kilowatt-hours, or 52%.

Why all this expansion and growth? Because the Vepco service area, one time predominantly agricultural, is today a widely diversified manufacturing area and the trend is toward industrial development more each year. Its people and institutions are conservative and Free-Enterprise minded. A temperate climate prevails here and a good supply of native labor is available. Being close to supplies of natural resources needed in manufacturing processes and with excellent transportation facilities—rail, water and truck—for shipping the finished products to the markets of the world, the Vepco service area is attracting more and more industries requiring more and more dependable power . . . for which Vepco builds ahead!

VIRGINIA ELECTRIC AND POWER COMPANY

Natural Gas Comes to Metropolitan New York

ATHERTON THOMAS

THE WORDS "NATURAL GAS" have come, to have a magic ring in the United States since World War II. The once despised by-product of oil wells has ceased to be a nuisance and has become the panacea that is going to cure all the ills of the fuel user—especially the small user. Throughout the Southwest and Middle West natural gas has revivified the gas business by stabilizing operating expenses and by deferring the day when costly new production capacity will be needed. The users of gas are getting service at a very attractive price, and the gas companies are no longer losing money. The technological problems of transmission of gas over long distances appear to be solved or at least under control. Certainly, the natural gas industry has already done so much to make life pleasanter and easier that the residents of any region that is about to receive this miracle fuel have been given ample grounds to expect that all their fuel worries are over. It is another question whether any fuel could do all that most people expect from natural gas. A skeptic might be inclined to discount some of the more extravagant claims—particularly in the New York Metropolitan area.

LONG TIME TO REACH NEW YORK

It took natural gas a long time to reach New York, but not from lack of study of ways and means. The economics of natural gas have been examined and re-examined for years by the gas and electrical companies in and around New York City. Nothing ever came from these studies before the war for the very simple reason that natural gas could not compete with oil and coal prices. The cost of bringing natural gas all the way from the fields in Texas and Louisiana was too high. The background was very different when the war ended. Oil and coal prices had doubled, and much progress had been made on the technological problems of transportation. That is, it became practical to operate pipe lines at pressures as high as 800 pounds per square inch. The net result was that natural gas began to look attractive and economical in the New York area.

FIRST TO REALIZE CHANGED CONDITIONS

Transco, as the Transcontinental Gas Pipe Line Corporation is familarly known, was one of the first to realize the significance of the changed conditions. By late summer of 1947, their plans were far enough along to lay concrete proposals before the Federal Power Commission. The preliminary engineering had been done, they had the gas under contract in Texas and Louisiana, they had a market comprising nine of the larger utilities selling manufactured gas in the Northeast, their financing was arranged, and last, but by no means least, they had firm promises from manufacturers for the pipe. The proposed line was to start in the natural gas fields of southern Texas, about 20 miles north of the Mexican border, and run along the coast of the Gulf of Mexico, then northward along the Atlantic Seaboard to New York City—in all something over 1,800 miles.

FPC DECIDED LINE WAS PRACTICAL

After a thorough study of the project and many long hearings, the Federal Power Commission decided the line was practical. Transco had shown that the market existed and was reliable, that they had access to sufficient gas reserves to supply the market for at least twenty years, and that the engineering and financing looked reasonable. The Commission also decided that the line was in the public interest and in May 1948 authorized Transco to build it. Some two and a half years later, on January 10, 1951, the first natural gas was delivered to the New York companies* at 134 Street and the Hudson River. It was no mean feat of construction to build an 1,800-mile pipe line of that size across such an assortment of rivers as the Mississippi, the Atchafalaya, the Tombigbee, and the Hudson, and through swamps and over mountains, in two and a half years' time.

340 MILLION CUBIC FEET A DAY

The original plans called for a line that would deliver 340 million cu ft of gas a day, all of which was destined for the New York–Philadelphia area. When the line actually went into service last January, it was able to carry far more gas than originally proposed in 1947 and serves a wider market. Hardly had public discussion of the project begun, before it became apparent that more gas was needed. Not only was the housing boom pushing up the needs of Transco's original customers, but also many of the southern communities along the right of way quite naturally wanted to share in the benefits of the natural gas flowing under their doorsteps. In addition, there was the vast untapped market of New England. The pressure of this demand for more gas brought about an increase in capacity to 505 million cu ft per day while the line was still under construction. A later authorization brought the capacity of the southern section up to 555 million. Transco expects to complete the latest expansion by this spring.

EXTENSION TO NEW ENGLAND DEFERRED

The extension to New England originally scheduled for last fall had to be deferred, owing, among other things, to the difficulty of obtaining pipe after the outbreak of the Korean war. This postponement makes New England's share of the gas available for reallocation until the extension is built. As this article was written, the Federal Power

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*The five New York companies in this article are:
Brooklyn Borough Gas Company.
The Brooklyn Union Gas Company.
Consolidated Edison Company of New York, Inc.
Kings County Lighting Company.
Long Island Lighting Company.

Commission was trying to decide which of the many communities clamoring for more gas shall temporarily inherit the quantities earmarked for New England.

SIZE OF THE NEW YORK AREA

How big is the New York area? A total of 334 million cu ft of gas or two thirds of Transco's total capacity flows into the Metropolitan New York area daily. And 251 million or about half the line's capacity is delivered at one point, 134 Street and the Hudson River—the natural gas gateway to New York City. Here five New York companies take over. Together, they supply gas to all of New York City (except Staten Island), to Long Island, and to most of Westchester County. Staten Island has a separate natural gas supply from the Texas Eastern Transmission Company which operates the Big and Little Inches.

TRANSCO'S RESPONSIBILITY ENDS AT CITY LINE

Transco's responsibilities end at the city line. From there on, the problem of distributing the gas to the householder is up to the local utilities. Obviously, it is more economical for them to distribute the gas jointly than to build five separate mains from the delivery point. So the New York companies entered into an agreement to build a single main which would pick up the gas delivered by Transco at 134 Street and the Hudson River and distribute it to the plants of each of the companies. Under the contract, called the New York Facilities Agreement, the costs of building and operating this distribution main are pooled and then shared by the participating companies, in accordance with a formula based on the contract demand for gas that each company has with Transco. The agreement contemplates another delivery point when Transco finishes the second Hudson River crossing this spring. This alternate route goes by way of Staten Island and the Narrows to Brooklyn. The New York companies distribution main will then become a loop which can be fed from either end or both. Plans are being made to establish a third delivery point in Westchester County when Transco completes its New England connection.

WHAT WAS EXPECTED OF NEW FUEL

Turning from the physical problems of bringing natural gas to New York, let us look at what was expected from the new fuel and how well it has lived up to its promise. The depression of the '30's hit the manufactured gas companies particularly hard. Many of them turned to space heating to bolster revenues. Manufactured gas was a luxury fuel and had to be sold at luxury prices. But its flexibility and cleanliness commended it to all users. Then came World War II. People who had gas heat pretty generally kept warm while war requirements often caused shortages in other types of fuel. If there had been any practical way of running a battleship or an airplane on gas, it would probably have been in short supply too. After the war, the New York area shared a building boom with the rest of the country. Builders for some time could get gas heating equipment when nothing else was available and often at a lower price. Wages and prices started to skyrocket. Heating fuels followed the trend, but the regulated gas industry lagged behind. Gas became not only the most desirable fuel for heating homes but also the most economical. As a result, better than 9 out of every 10 new one- and two-family houses built in the immediate postwar period in Metropolitan New York had gas heat.

ADVERSE EFFECT OF RISING COSTS

The rising costs adversely affected the manufactured gas business in two ways: (1) Higher fuel and wage costs increased operating expenses to such an extent that many companies were operating in the red. (2) The high postwar costs of new plant needed to meet the rapidly increasing loads could not be financed from revenues held down by regulation to prewar levels. Furthermore, the continuity of fuel supply was always subject to the vagaries of winter weather and labor-management disagreements in the fuel and transportation industries. All in all, the outlook for manufactured gas companies was rather bleak in 1947 if they kept on doing business in the traditional way. At the same time, producers of natural gas had such a surplus that it was almost a drug on the market.

WOULD REVITALIZE GAS BUSINESS

It was hoped that a switch to natural gas would revitalize the gas business in New York City as it had in the Middle West. Of course, natural gas delivered to the Eastern Seaboard from Texas cannot be expected to have as great a competitive advantage over other fuels as it enjoys in the Southwest or Middle West. Putting it another way, natural gas at the end of an 1,800-mile pipe line is not a cheap fuel and cannot be, even if the gas were given away free at the fields. While pipe-line companies have done a good job in keeping costs down, it still is appreciably more expensive to transport a given amount of heat in the form of gas from Texas or Louisiana to New York than it is to bring the same amount of heat as coal from the mines in Pennsylvania or West Virginia.

SUBSTANTIAL SAVINGS WERE ESTIMATED

Even so, substantial savings were estimated for Transco's customers on the Eastern Seaboard. The Federal Power Commission's opinion no. 165 quoted estimates showing that Transco's original nine customers would save over $24 million in operating expenses, based on 1947 fuel prices, and would release over half a billion gallons of scarce fuel oil for other purposes. Over $20 million of the saving was estimated to accrue to the five New York companies.

PRICE DIFFERENCE ACCOUNTED FOR SAVINGS

The difference in price between oil and natural gas accounted for most of the estimated savings. Hence, the amount of dollar savings will vary with the price of oil. When oil prices rise, calculated savings will increase, and a drop in oil price results in less savings, although the price of natural gas remains unchanged. This point is emphasized to illustrate the possibilities of misinterpreting calculations of savings from natural gas. For example, the six months' drop in oil prices between November 1948 and May 1949 eliminated three quarters of the savings. This wide swing in calculated savings would not have had the slightest effect on the operating expenses and earnings of a company distributing natural gas.

STILL CHEAPEST FORM OF FUEL

As prices stand now at the beginning of 1952, natural gas delivered in bulk at New York City is still the cheapest form of fuel, provided the pipe line is fully loaded day in and day out all year long. The price is less favorable when the pipe line has to absorb the wide differences between the heavy demands in the winter heating season and the light summer loads. However, even under the most favorable conditions, the price advantage enjoyed by natural gas is not great and may soon disappear entirely. Pipe line companies like all businesses are being forced to raise their rates to meet the rising costs and higher taxes confronting them. Transco is requesting an increase amounting to some 25% for the New York area. Should the request be approved by the Federal Power Commission, while other fuel prices remain constant, the price advantage of natural gas would be practically wiped out.

FUEL SAVINGS REALIZED FIRST

Fuel savings are the most obvious and generally the first to be realized when natural gas is introduced, but they are not the only savings. Operating and maintenance labor can be reduced over a period of time. Expenditures for new production plants can be deferred and existing plants can be converted for use with natural gas at a relatively small cost.

ADVANTAGES FELT IMMEDIATELY

The effects of the advantages outlined here began to be felt as soon as the first natural gas was received. The upward trend of gas rates stopped at least temporarily. None of the New York companies has asked for an increase in gas rates since the advent of natural gas. Three of them have even been able to make some rate reductions.

REPLACED OIL IN MANUFACTURING PROCESS

Initially, all of the New York companies used natural gas to replace oil in the manufacturing process. This produced a gas that was practically the same as the "manufactured gas" they had been distributing for years. That is, the new gas had the same heat content per cubic foot as the old gas and burned about the same way in most appliances. In fact, about the only change that most customers would notice was in the odor—that was very different.

ADDITIONAL SAVINGS THROUGH DIRECT DISTRIBUTION

Obviously, additional savings can be made when it is practical to distribute natural gas directly rather than to go through the intermediate step of changing it to "manufactured gas." Since a cubic foot of natural gas has about twice the amount of heat as the same volume of manufactured gas, the carrying capacity of distributing mains is doubled. As a consequence, a substantial growth of business can be accommodated without the necessity for extensive capital outlay for additions to the distribution system.

CONVERT GAS-BURNING EQUIPMENT

Before a gas company can shift to the distribution of straight natural gas, it is necessary to adapt or convert all gas-burning equipment. This conversion involves an adjustment of all customers' ranges, refrigerators, water heaters, dryers and furnace burners. The adjustment is usually performed by the company or by a contractor engaged at the company's expense. The cost of conversion must be amortized by the company out of savings over a period of years and requires the approval of the New York Public Service Commission.

ALL HAVE ACTIVE CONVERSION PROGRAMS

All of the New York companies have active conversion programs. Two have already completely converted their distribution systems to straight natural gas, and another plans to start complete conversion this summer. The fourth company converted over a quarter of its load last summer and hopes to convert more this year. The fifth company plans to convert more than a third of its load this summer.

COMPLEX ECONOMIC AND ENGINEERING CONDITIONS

The desirability of converting any specific area to straight natural gas depends on a complex interplay of numerous economic and engineering conditions. Two factors are of predominant importance in the New York area and can be expected definitely to control the speed of conversion: (1) There is not enough natural gas available now to convert the whole area. How fast conversion can be made will depend on how much and when more natural gas becomes available to the city. (2) The costs of conversion may be so high in some parts of the area that it will be impossible to amortize them within a reasonable period of time. The cost of doing any kind of business in New York is high. Changing customers' equipment over to natural gas is no exception.

CONVERTED AREAS PRODUCE GREATEST SAVINGS

The areas already converted or planned for conversion are the ones that can be expected to produce the greatest savings. When these are completed, it seems only logical to expect that the rate of conversion will slow down and that each additional step will be preceded by a very careful weighing of the relative advantages and disadvantages.

SUMMARY

It has always been dangerous to draw conclusions from too few data, and so we can only tentatively summarize our progress report on New York's first year of natural gas. Even though natural gas is still in its infancy in New York, it has already shown that it will profoundly affect the future economics of our community. In the first year, natural gas has, on the whole, lived up to its advance promises. Engineering and operating results are about as good as predicted. Costs are in line with prior estimates. It has been possible to halt at least temporarily the upward trend of gas rates. As in any business, there are many future problems to worry about, but so far no unanticipated troubles have been uncovered. The outlook for natural gas seems no more hazardous than for any other industry in a world whose future is so uncertain. Natural gas has given Metropolitan New York everything that could reasonably have been expected in the first year and seems to have laid the foundation for sound future development.

Framed in the splendor of majestic Mt. Hood, Portland, Oregon is the focal point of the mighty Columbia Empire.

Be sure your convention plans include a trip to the busy and beautiful PACIFIC NORTHWEST

Your trip will not be complete without a journey to the picturesque Oregon Country. Big, bustling and beautiful—Oregon is one of the fastest-growing states in the nation. Industrially and residentially it is ripe for continued growth. Oregonians are proud of Portland. It is the only fresh water port on the Pacific Coast with facilities for ocean-going vessels. It is the world's greatest lumber shipping center. It is . . . well, you'll see for yourself when you come. And don't forget . . . because we're expecting you!

PACIFIC POWER AND LIGHT COMPANY
Public Service Building, Portland, Oregon
and
PORTLAND GENERAL ELECTRIC COMPANY
621 S. W. Alder Street, Portland, Oregon

The Growth Factor in Electric Utility Earnings

CHARLES TATHAM, JR.

IN THE NEW (THIRD REVISED) EDITION of *Security Analysis,* by Graham and Dodd, this writer has four chapters, which he contributed on the subject of public utility analysis. The following discussion is presented to elaborate on one phase of the subject, which, we now think was somewhat inadequately treated.

NOT A STATIC ART

Security analysis is not a static art, nor is it, we are convinced, one that has been fully explored. This adds to its fascination and to the hazards facing those bold enough to write about it.

QUESTION OF CORPORATE EARNINGS

The question of corporate growth and its effect on public utility common stock earnings, for example, is one that we believe we did not cover as thoroughly as the subject warrants. Further study indicates that at least some shift in emphasis should be made from the viewpoint implied in the book.

In the opening paragraphs of Chapter 39, entitled "The Valuation of Public Utility Common Stocks," we stated that the benefits of growth in the electric utility industry in terms of increasing per share earnings will, generally speaking, be moderate, "with an important determinant being the factor of leverage resulting from variations in the capital or security structure."

NOT A FACTOR IN STOCK VALUATION

And on page 499 we said, "Growth, in the sense of a substantial increase in per-share earnings, is not ordinarily a factor to be taken into consideration in the valuation of utility common stocks." This statement was footnoted by a comment which pointed out that some increase in per share earnings should result from the investment of retained earnings in additional plant and facilities, but that such increase would typically be at a lesser rate than the increase in revenue or net income.

BOTH STATEMENTS ACCURATE

Both these statements, we believe, are quite accurate, and we would not change them, although we now believe that possibly undue emphasis might be placed on them by the student. However, on page 500 we stated, "If the increase

Table 1

	Year A		Year B	
	Amount	Per-Cent	Amount	Per-Cent
Bonds, 3%	$ 500,000	50.0	$ 805,000	50.0
Preferred Stock, 4%	200,000	20.0	322,000	20.0
Common and Surplus	300,000	30.0	483,000*	30.0
Total	$1,000,000	100.0	$1,610,000	100.0
Gross Income	$ 60,000		$ 96,600	
Interest Charges	15,000		24,150	
Net Income	45,000		72,450	
Preferred Dividends	8,000		12,880	
Balance for Common	37,000		59,570	
Number of Common Shares	10,000		12,799*	
Earnings Per Share	$3.70		$4.66	
Market Price	50		63	
Price X Earnings	13.5		13.5	
Initial Investment at Market	$ 500,000			
Additional Investment at Cost			$ 183,000	
Entire Investment			683,000	
Balance for Common	37,000		59,570	
Return on Investment	7.4%		8.7%	

* 2,799 shares sold over the period at approximately 10% discount from prevailing market prices provides. $139,600
Increase in surplus provides 43,400
$183,000

in income accompanies property expansion it represents no more than a return on the additional capital invested and will not represent higher earnings on the *existing* investment."

STILL MISLEADING

In one sense this is an accurate statement of fact, but, viewed in another and very important light, it is definitely misleading.

On the same page we also said, " . . . in those cases where a 'full' over-all return is being shown, earnings growth, in the sense of an increasing percentage return upon the stockholder's investment, is not ordinarily to be expected." This statement is plainly incorrect, as should be realized from a study of our subsequent remarks and the table on page 501.

Again on page 520, in our final paragraph, we concluded that utility common stocks were attractive mainly for income purposes and that, generally speaking, "the capital appreciation that can be looked forward to will result primarily from a readjustment of market prices to a more normal level in relation to earnings and dividends."

DOES NOT TELL WHOLE STORY

This statement does not tell the whole story; it fails to take into account a very important attribute of the effect of growth on utility common stock per share earnings.

At this point we might interject a comment to the effect that this whole matter of growth and its bearing on utility equity values appears to have been a subject of some confusion, lack of agreement, and, perhaps, even lack of comprehension.

BENEFITS FROM TWO FACTORS

From the common stockholder's viewpoint, the benefits of growth result from two factors: (1) the reinvestment of earnings that are not paid out in dividends, and (2) the fact that new common shares are almost invariably sold at prices that are higher than the book value of the outstanding shares.

From the standpoint of sales, revenue, and investment, we believe that no one would attempt to deny that very substantial growth lies ahead for the electrical industry. Unless there is to be a constant and permanent decline in the allowable rate of return (which seems unlikely) the increase in gross income should parallel the increase in the investment.

SHOULD PARALLEL INCREASE IN GROSS INCOME

If senior capital costs and common stock equity ratios continue at approximately present levels, moreover, the increase in the balance for common should parallel the increase in gross income. This is simply a matter of arithmetic.

SALE OF ADDITIONAL SHARES

A portion of the increase in the investment, of course, will have to be financed by the sale of additional shares of common stock. Typically this stock will be sold at prices materially exceeding book value. In view of this, a lesser number of new shares will have to be sold in order to obtain a desired number of dollars, than would be so if the new shares were sold at book value. If the earned return on the total enlarged equity remains the same (as it is reasonable to expect), it is obvious that per share earnings will increase, since the increase in the number of shares will be less than the increase in the dollar amount of the equity.

This is made clear by reference to Table 1, which is a reproduction in condensed form of Table 126 on page 501 in *Security Analysis,* with certain additional computations appended.

10% GROWTH OVER FIVE YEARS

In this hypothetical case, a 10% growth trend over a period of five years is assumed. The expansion in investment is financed so as to maintain capitalization ratios of 50% bonds, 20% preferred stock, and 30% common stock and surplus. It is further assumed that the over-all return is stabilized at 6% and that common dividends paid out average approximately 81% of available earnings.

Table 2

	Year A	Year B
Common and Surplus	$300,000	$483,000*
Earnings for Common	37,000	59,570
Number of Common Shares	10,000	13,723*
Earnings Per Share	$3.70	$4.34
Market Price	51	60
Price X Earnings	13.8	13.8
Initial Investment at Mkt. (Per Shr. basis)	$51	
Additional Investment		- Nil -
Earnings Per Share	3.70	4.34
Return on Investment	7.25%	8.50%

* 3,723 shares sold over the period at approximately 10% discount from prevailing market prices provide $183,000

INCREASE PER SHARE AT LESSER RATE

It will be seen that the 61% increase in the investment over the period is accompanied by a 61% increase in gross income and balance for common. The increase in per share earnings is at a typically lesser rate, or 26%, due to the increased number of shares.

ACTUAL INCREASE IN PERCENTAGE RETURN

There is, however, an actual increase in the percentage return on the common stockholder's investment over the period from 7.4% to 8.7%. For simplicity, let us assume that an investor buys the entire outstanding common stock in year *A* at its average market price of 50. His investment, therefore, is $500,000 and in year *A* his earned return (balance for common) is $37,000, or 7.4%. Over the five-year period he subscribes to all the additional common shares issued, which requires an additional investment of $139,600. In addition, undistributed earnings (part of his return), in the amount of $43,400, are invested in the business. In year *B,* therefore, his aggregate investment is $683,000, on which a return of $59,570, or 8.7% is earned. This demonstrates more accurately than our comments in *Security Analysis* indicate how the growth factor in utility earnings benefits the equity investor.

REFLECTED IN HIGHER MARKET VALUE

The increase in earned return, moreover, should normally be reflected in a higher market value for the investment. For example, in year *B* the aggregate investment should normally have a market worth of approximately $805,000 (at 13.5 times earnings), representing an appreciation of $122,000 (compared with the investment of $683,000) over the period. This gain in value might be considered as part of the return, in addition to dividends received. If this is done in the illustration used, it works out to an average annual return of approximately 11%.

TWO OTHER ASSUMPTIONS

The workings of growth can also be viewed on the basis of two other assumptions: (1) that the stockholder makes *no* additional investment: that is, that all earnings are paid out and additional equity capital is provided by others, and (2) that no common dividends are paid and no additional shares are sold. In this latter instance retained earnings alone would provide the necessary increase in equity capital.

Under the first assumption the time period, increase in investment, gross income, and balance for common are the same as set forth in Table 1. Similarly, capitalization ratios of 50-20-30 are maintained, and a constant 6% over-all rate of return is assumed. The only variation will be in the number of additional common shares sold to provide the necessary additional equity capital.

INCREASE THROUGH SALE OF COMMON STOCK

In this instance, since all earnings are paid out, the entire increase in the equity investment must come through the sale of common stock. The results are shown in Table 2.

EARNINGS HAVE RISEN

In this case, although the common stockholder has not put a penny of additional money into the business, by reason of the additional outside capital coming in, he has seen his earnings rise from $3.70 per share to $4.34 per share, an increase in the return on his investment from 7.25% to 8.50%.

EQUITY GROWTH FINANCED BY RETAINED EARNINGS

Under the second supposition, the entire equity growth is financed by retained earnings and no dividends are paid on the common stock. In lieu of income over the period, the stockholder sees a substantially greater gain in the capital value of his investment.

WOULD RESULT IN INCREASING EQUITY RATIO

On the basis of the assumptions made concerning growth rate, over-all return, capitalization ratios, and senior charges, the retention of all common stock earnings would, in the absence of significant charges to surplus, actually result in an increasing balance sheet equity ratio, and in a somewhat greater gain in earnings for the common. Over the period the results given in Table 3 would be shown.

USED BOOK VALUE AS MEASURE

In this instance we have used book value as the measure of the investment, since, in the absence of dividend payments, there is little basis for attempting to estimate a reasonable market price. However, if we assume a constant price in relation to earnings, the presentation is comparable to the two previous ones.

DECLINE IN LEVERAGE

It may be noted that, in this third example, the earned return on the equity declines somewhat in terms of *percentage,* from 12.3% in year *A* to 11.4% in year *B.* This is a reflection of the decline in leverage.

Table 3

	Year A	Year B
Common and Surplus	$300,000	$558,100
% Total Capitalization	30.0%	33.6%
Earnings for Common	$ 37,000	$ 63,600
Number of Common Shares	10,000	10,000
Earnings Per Share	$3.70	$6.36
Book Value	30.00	55.81
% Increase in Book Value		86.0%

Table 3, of course, presents an extreme type of situation which is not likely to arise under normal conditions, although it might under certain circumstances of financial reorganization. The two preceding examples illustrate, we believe, more pointedly the growth factor as it affects per share earnings.

RECOGNITION OF GROWTH FACTOR

To what extent should this growth factor be recognized in the investment appraisal of utility common stocks? It is not easy to answer this question precisely, although some recognition should logically be accorded. The investment value of a common stock is not based on its current earnings or on the earnings expectable next year. As Messers. Graham and Dodd point out, "For the investor . . . next year's profits are of real importance only if they can be viewed as indicative of the longer-term *earning power.*" And, "value cannot soundly be established on the basis of earnings shown over a short period of time."

PROJECTION SHOULD ENVISAGE EXPECTABLE EARNINGS

These authors suggest that an earnings projection be made so as to envisage expectable average earnings over a number of years in the future. "In our theory of valuation the expectations for a moderate term of years—generally the next five to ten—are formulated in a specific estimate of earnings and dividends." And also, "The average earnings will be estimated for a period running ordinarily between five and ten years." (These four quotations are from *Security Analysis.*)

The SEC has similarly emphasized that investment values must be based on earnings reasonably expectable over the indefinite future. In a memorandum presented in 1948 before the District Court dealing with the liquidation of Northern States Power Company (Delaware), the Commission commented as follows on the prospective earnings of Northern States Power (Minnesota), on the basis of which investment value was determined: "The Commission's estimate is not a 1-year or 5-year figure, but an average applicable to the indefinite future of a prosperous and growing company in a young and vigorous industry."

DEBATABLE QUESTION

However, if a trend of rising earnings is indicated, it is a debatable question how far in the future one should look in attempting to reach a reasonable judgment concerning investment value. Presumably the expected growth can be recognized either in the capitalization rate or in the selection of an earnings figure higher than that being currently experienced. We favor the latter method and believe that the earnings level selected might reasonably be that which a careful projection indicates will be reached within two to three years.

MUST BE FORWARD LOOKING

Investment appraisals of common stocks in a growing industry must necessarily be forward looking. If this growth can be expected to produce increments of value with the passage of time, this factor must be given weight in determining a stock's present worth.

Newport News Shipbuilding and Dry Dock Company

Quarterly Statement of Billings, Estimated Unbilled Balance of Major Contracts and Number of Employees

(Subject to audit adjustments)

Bilings during the period:	**Three Fiscal Months Ended Dec. 31, 1951**	**Three Fiscal Months Ended Dec. 31, 1950**	**Year Ended Dec. 31, 1951**	**Year Ended Dec. 31, 1950**
Shipbuilding contracts	$11,895,074	$ 7,746,864	$37,832,110	$37,577,052
Ship conversions and repairs . .	15,606,339	4,927,306	36,831,783	9,757,927
Hydraulic turbines and accessories .	2,438,047	914,850	5,974,581	5,243,848
Other work and operations. . .	3,119,932	2,095,951	8,865,409	4,715,509
Totals	$33,059,392	$15,684,971	$89,503,883	$57,294,336

	At Dec. 31, 1951	**At Dec. 31, 1950**
Estimated balance of major contracts unbilled at the close of the period	$353,198,112	$99,805,157
Number of employees at the close of the period	14,069	8,933

The Company reports income from long-term shipbuilding contracts on the percentage-of-completion basis; such income for any period will therefore vary from the billings on the contracts. Contract billings and estimated unbilled balances are subject to possible adjustments resulting from statutory and contractual provisions.

By Order of the Board of Directors

January 23, 1952

R. I. FLETCHER, *Vice President and Comptroller*

A Scientific Formula in Operation

HENRY J. SIMONSON, JR.

PROGRAMS FOR SPECULATION are often based not on buying when stocks are cheap and selling when they are dear, but on buying when they appear to be headed for higher prices (whether they are then cheap or dear) and selling when they appear to be headed for lower prices (whether they are then dear or cheap).

But such speculative programs are never correctly described as *formula plans.* Formula plans, almost without exception, differ from such speculative programs in that they look to a more distant future than do the speculative programs; and, *because* they look to a more distant future, they are primarily interested in values rather than in mere market movements—which are, at times, completely divorced from values.

When the followers of a formula plan decide to sell stocks, they do so not because the formula indicates that prices are already heading downward, but because it indicates that they have reached a level which, in the not too distant future, will be considered to have been too high *from a value standpoint.* This high price level may, of course, seem, at the time it occurs, not at all too high from the standpoint of such a criterion as "stock yield," which is based on the mathematical assumption that present rates of dividend will continue, if not *ad infinitum,* at least so far into the future as to make changes thereafter completely irrelevant from a present value standpoint.

The history of stock prices shows that shares do not continue to be too "dear" in this manner for any very extended period. They inevitably fall back into a relatively more reasonable price position—and usually far below a reasonable price position, down to a level that is as relatively cheap as the higher level had been dear. And the essence of virtually all formula plans is to outline a method by which at least some profit (with little risk) may be realized from those changes in price that succeed excessively high or excessively low prices—*relative to values.* All the better formula plans give recognition to the long-term or "secular" upward movement of stock prices.

CONSTRUCTING A PLAN

When attempting to construct and operate such an investment formula plan, we are therefore faced with two problems:

1. The problem of deciding on some rules or a formula for determining when stocks are relatively cheap or dear.
2. The problem of deciding on some rules or a formula—based on problem 1—that will give actual signals telling when to buy or sell.

It is necessary that the formula plan should contain both these elements, but this fact should not lead us to forget that these elements are quite separate concepts — even though problem 2 is based on problem 1. It is problem 2 that gives us the actual buying and selling signals.

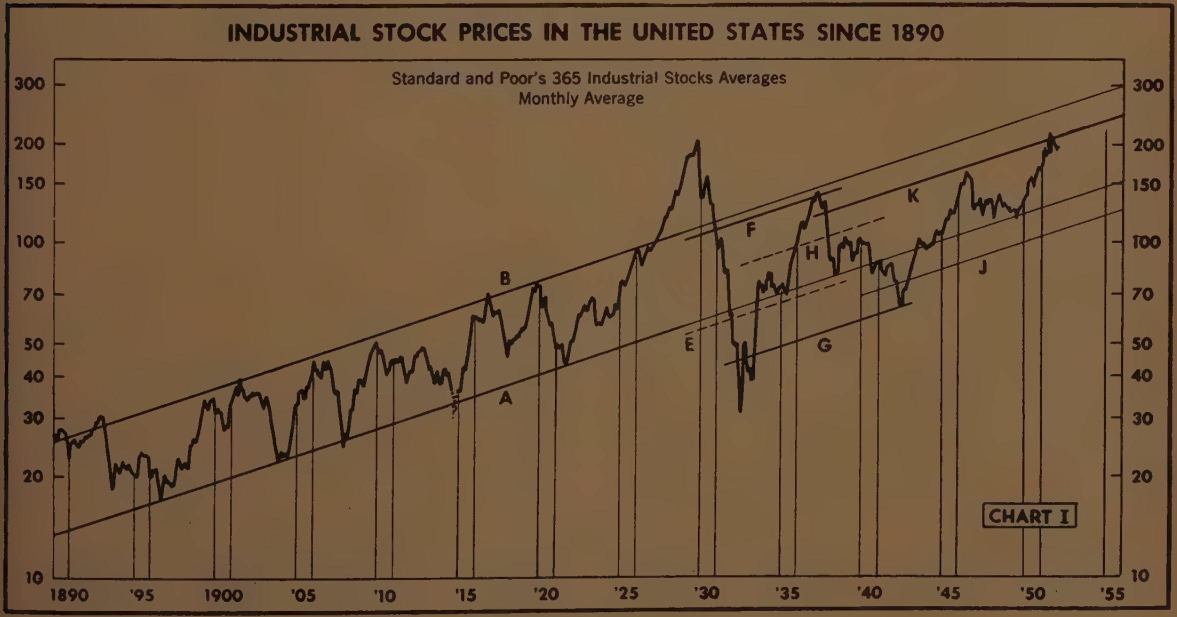

Figure 1

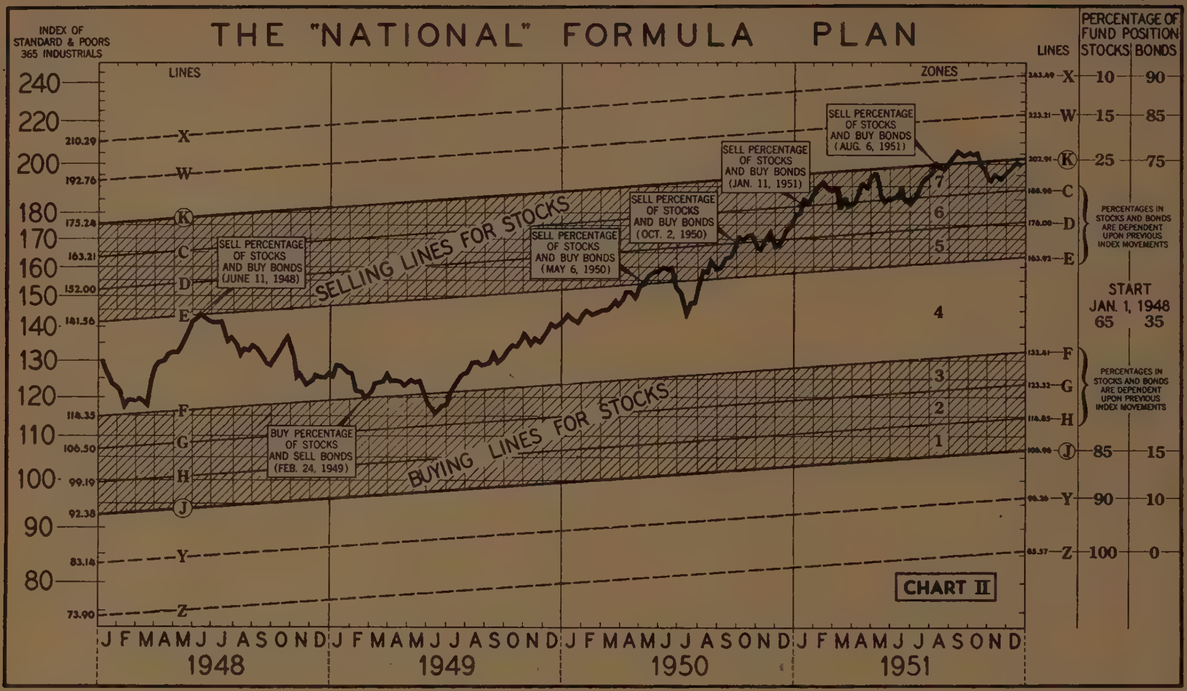

Figure 2

The "National" formula plan of National Securities & Research Corporation is empirical in the sense that it is based primarily on the evidence presented by the history of stock prices—the remarkable regularity and consistency of the *long-term* rate of advance (in definite troughs or channels).

An exception to the continuing reliability of any particular channel occurs during and immediately after all really radical upsets in the general economy. There are two such upsets in the period covered by Figure 1. The first occurred in the middle '90's and the second in the period 1929–32.

RESUMPTION OF UPWARD TREND

After each such radical upset, the long-term secular trend of the channel carrying the prices is resumed. The rate of annual advance remains the same, and the distance from the lower boundary of the new channel to the upper boundary of the same tends to be the same or about the same as it was in the old channel. But the new channel is different. It is lower than it would have been if the old channel had been continued. Such resumptions of similar trends (at lowered levels) are seen in banking statistics in the periods 1837–43, 1857–59, 1873–77, and so on.

But the resumption of the movement is not always immediately as orderly as it originally was. The price fluctuations do not always immediately become confined to the new channel. They begin by ranging outside the channel but, at each successive oscillation, come closer to being confined to the channel. They present an almost typical illustration of what the engineer describes as a "damped vibration." In the period after 1929–32, each oscillation outside the channel tends to be half as great as the preceding one.

But, if we are to guard ourselves against the possibility of the picture changing its nature radically, we will not base our estimates of the probable range of each oscillation on any mathematical assumption of "prearranged harmony" but will describe the successive fluctuations in a formula that will be influenced by what the market actually did during each "cycle"—even though it be true that, if the *data* followed the first hypothesis *exactly,* the second would give indentically the same result.

MOVEMENTS AFTER 1932

On the assumption that, after 1932, the tendency would be to work back into and possibly a little beyond a band of the width of the 1892–1927 *A* and *B* band (as shown in Figure 1), whose upper level would be (on a logarithmic scale) exactly as much below the 1929 top at that time as its lower level was above the 1932 bottom at that time, the lower line *E* and the upper line *F* are put in. The recovery from 1932 reached, in 1937, a very small percentage above the corresponding point on the upper *F* line. The line *F* had placed the top in 1937.

But the rise from the low of 1932 to the high of 1937 was of course, once again much greater than would be contained within the width of an 1892–1927 *A–B band.* Therefore, the operation is repeated to see how closely the next low of the market would approach the lower line *G* of two lines *G* and *H,* whose distance apart was the same as that of the *A* and *B* lines, and of which *G* was as much above the low of 1932 at that time as H was below the high of 1937 at that time. The low of 1942 fell virtually on this line G.

Under the first hypothesis, the channel about which the "damped vibrations" would occur would be determined by placing a channel with the same slope as the A, B, and indeed all the sloping lines, but such that the perpendicular distance from the high point of the 1929 data to the upper boundary of this channel would be exactly twice as great as the perpendicular distance from the low point of the 1932 data to the lower boundary of this channel.

Under the second hypothesis, each successive channel is determined by placing it in such a manner that the perpendicular distances are *equal.* The reader may easily demonstrate to himself that the "damped vibration" presented in 1 exactly touches first one and then another of the boundary lines of 2. However, this occurs when the data follow meekly the original. When they do not, the second approach, which the "National" formula plan uses, seems superior.

DETERMINING ACTUAL SIGNALS

If we take, as the channel, the normal movement *plus any calculated excess,* the whole series suggests strongly that the data tend to be *confined to, or virtually confined to,* the successive channels. But the movements of the data do *not* suggest that they must necessarily move (after leaving one boundary) the entire distance to the other boundary. In other words, they suggest strongly that prices are relatively high when the data line is close to the upper boundary of a containing channel and relatively low when the data line is close to the lower boundary of a containing channel; but they say little or nothing about when the data line is far from both boundaries.

PROBLEM 2

Now problem 2 arises—the problem of deciding on some rules or a formula to be used to obtain, from the results of problem 1, actual signals telling when to buy and when to sell. National Securities & Research Corporation in its formula plan has constructed a set of rules (illustrated in Figure 2) that are designed to preserve an extremely conservative attitude but also one that should, over the years, give definitely better results (by having at times a portion of the fund invested in high-grade bonds) than could be obtained by being at all times fully invested in common stocks.

This is the sort of treatment that should appeal especially to those handling large funds. But, of course, some investors might prefer a somewhat more courageous attitude—which might be easily obtained by a one-place upward shift in the separate lines indicating actual selling signals. And it is, of course, true that such a procedure might perhaps be preferred by an individual who was more ready to "take his chances" with the market than to switch—at any time—any appreciable percentage of his funds into high-grade senior securities.

CONCLUSION

Any formula plan of investment, giving buying and selling signals, involves selection of the type and grade of securities and the individual issues to be bought or sold. Also formula plans to operate effectively should be applied to a large number of securities. Hence aggregations of capital invested in securities such as are maintained by educational foundations, pension and profit-sharing funds, and mutual investment funds are using formula plans as a guide to their investment management and in order to eliminate emotionalism from judgment.

* * *

In the race between a horse and a locomotive on August 28, 1830, the locomotive lost.
Merchants Magazine

The last tie was laid to complete the "joining of the Atlantic and Pacific" by rail. Leland Stanford drove the last spike, made of California gold.

Private ownership and operation of American railways was an inevitable result of the American experience with state ownership and operation of canals and other public works prior to 1850.
W. M. W. Splawn

AVCO reports for 1951

HIGHLIGHTS

	Year ended Nov. 30, 1951	*Year ended Nov. 30, 1950*
Consolidated net sales	$286,598,113	$256,966,971
Consolidated net income	$10,089,214	$12,635,633
Earned per common share	$1.10*	$1.65**
Dividends per common share	$0.60	$0.50
Net working capital	$87,933,721	$70,980,186
Net tangible assets *(net worth)*	$88,620,194	$81,273,695
Per common share	$9.07	$8.65
Per preferred share	$514.00	$402.00
Number of stockholders	63,288	57,119

**Based on 8,819,385 common shares outstanding at close of fiscal 1951.*

***Based on average number of common shares outstanding during fiscal 1950.*

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* * *

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420 LEXINGTON AVENUE, NEW YORK 17, NEW YORK

The Science of the Air Transport Industry

A Review and Forecast

JOHN H. LEWIS

GROWTH TREND IN THE INDUSTRY

FROM THE BEGINNING of the United States air line industry in 1926, a rapid growth trend has been apparent. From 1931 through 1941, air line passenger-miles increased at the average annual rate of 28.4%. After a smaller increase in 1942, the average annual increase during the abnormal war years of 1943 through 1946 advanced to 44.9%. In 1947 its growth in terms of revenue passenger-miles was arrested; and in 1948, for the first year in the history of the business, total revenue passenger-miles flown by all domestic air carriers declined from the previous year. The decline was only 2.3%, but it came after a two-year plateau and caused concern about the validity of the continued existence of the industry's previous substantial growth trend. Apparently the industry was only digesting the abnormal increases of the war years. In 1949 the industry recorded a 12% increase in revenue passenger-miles flown over those of 1948. In 1950 the increase expanded to 18.8%, and in 1951 growth of air line passenger traffic amounted to about 28.6%.

REMINISCENT OF 1933–41 INCREASE

The 28.6% increase is reminiscent of the average annual increase of 28.4% from 1933 through 1941. It would probably be too optimistic, however, to conclude for the future that a straight-line growth trend of 25 to 30% per year is still active in the industry, particularly in view of the increased base to which the percentage of increases applies, and the abnormal defense-stimulated conditions of 1950 and 1951.

ONE APPROACH

One approach to projecting the future would assume that air line traffic will continue to increase each year, although at a progressively decreasing rate, in relation to total common carrier traffic. To reflect this trend statistically, we computed air line passenger-miles as a percentage of the sum of railroad and air line passenger-miles during a ten-year period, and fitted a Gompertz curve, which assumes a progressive decrease in the rate of increase, to the data.

INCREASE MAY BE FORECAST

If this same curve be used to project 1952 travel and if certain other assumptions are made,[1] 1952 air line travel would be projected at a maximum of 11.3 billion revenue passenger-miles, compared with a projection of 12.7 billion miles if a straight arithmetical 25% rate of growth is used. Unless a business recession occurs and provided the industry expands high-density coach operations at the 4-cent

Table 1. Growth Trend in Air Line Passenger Traffic

United States Intercity Travel
In Billions of Revenue Passenger-Miles

		Railroads				Air Line Passenger-Miles as % of	
Year	Air Lines	Pullman	Pullman & Coach	Buses	Private Automobiles	Pullman Miles	Total Rail- & Air-Miles
1951e	10.150	9.9	30.1	na	na	102.5	25.3
1950	7.932	9.3	26.8	19.7p	na	85.3	22.8
1949	6.678	9.3	29.6	20.5p	na	71.8	18.4
1948	5.963	11.0	35.3	23.0	293.2	54.3	14.4
1947	6.104	12.3	40.0	23.4	274.0	50.0	13.2
1946	5.948	19.8	58.8	25.6	253.6	30.0	9.2
1945	3.362	26.9	86.3	26.9	179.8	12.5	3.7
1944	2.178	26.9	90.2	26.5	151.3	8.1	2.3
1943	1.634	24.7	82.6	27.4	147.1	6.5	1.9
1942	1.418	17.9	49.0	21.5	199.6	7.9	2.8
1941	1.385	9.2	25.2	13.6	264.3	15.1	5.2
1937	0.412	8.1	20.5	10.0	212.3	5.1	1.9
1931	0.091	na	15.9	6.7	168.6	na	0.6

e Estimate.
p Projected from 1948 on the basis of Greyhound's Experience.
na Not available.

level, as hereinafter discussed, a 20% increase in air line revenue passenger-miles flown in 1952 over 1951 may be forecast.

The trend of air line passenger traffic in relation to other common carrier travel is shown in Table 1. You will note that air line traffic in 1951 exceeded Pullman traffic for the first time in the history of the industry.

GROWTH WITHIN THE VARIOUS DIVISIONS OF THE INDUSTRY AND FREIGHT POTENTIAL

Within the industry, passenger revenues remain of primary importance, as opposed to freight in the railroad industry. Nevertheless, the greatest percentage growth since 1946 in the air line industry has taken place in freight revenues. Of some significance is the estimated decline in mail pay in dollars, during 1951, coincident with an increase in mail ton-miles flown—to the highest level in history. The average mail-pay rate per ton-mile was down to 69 cents. This rate compares with a rate of $1 in 1950, and is below the 74-cent level that prevailed in 1947, when the industry had its worst year, profit-wise. Table 2 shows the relative importance of the major types of traffic.

FREIGHT REVENUES UP 412%

While passenger revenues increased during this six-year period by about 114%, freight revenues were up 412%. In 1945 the domestic air lines flew only 1.4 million freight ton-miles. In 1946 this figure was up to 14.8 million at an average cost of 29 cents per mile. In 1951, when the industry flew 107.0 million freight ton-miles, the average cost was 19 cents. This total freight traffic is still infinitesimally small, compared with total railroad ton-miles of 588.5 billions carried in 1950, but there is little doubt that air transportation of many products, such as airplane parts and certain machinery parts, has become standard. In addition, apparel, drugs, radio, television, flowers, nursery stocks, and vegetables are obtaining increased volume.

WILL ASSUME INCREASING IMPORTANCE

As new types of airplanes designed for cargo transport are developed and placed in operation, it can be expected that air freight will assume increasing importance. These new airplanes may enable a reduction in tariff rates and expand the fields that the air lines can reach. Compared with an air freight cost of 19 cents per ton-mile, Railway Express on a shipment from Burbank to New York is estimated to cost 16½ cents per ton-mile, railway freight 8.3 cents, and motor truck 7.2 cents. By comparison Lockheed estimates, on its Super Constellation Model 1049B, especially developed for carrying cargo, that operating cost per ton-mile will be 4.92 cents. Doubling this figure to allow for overhead still leaves a total cost of less than 10 cents per ton-mile. When it is considered that shipping by freight involves much less packing and saves considerable time and crating charges, the basic competitive ability of the air carrier in the freight field becomes apparent. At a 10-cent rate per ton-mile, it would take only 5 billions of revenue ton-miles to have freight revenue total $500 million annually, which is not far from the total passenger revenues during 1951. Without a decrease in the rates, the New York Port Authority estimates a fivefold growth in the industry air freight volumes in the next fifteen to twenty-five years.

ACTION OF AIR LINE STOCKS

Despite the tremendous growth that is still apparent in the air line industry and its probable dynamic future, the market prices of air line stocks, as reflected in the Lewis Indices of Airline Securities, have not indicated any overwhelming desire on the part of the investing public since 1946 to purchase air line equities. From the accompanying chart, it may be seen that air line stocks roughly paralleled the performance of the Dow Jones industrial averages up to 1944. In that year air line stocks advanced far more sharply than the Dow Jones average. The high relative prices of air line equities lasted until 1946. Subsequently, however, they dropped more sharply than the Dow Jones industrial average. This decrease continued until the first quarter of 1949, when a new and more liberal policy with respect to air mail pay was promulgated by the Civil Aeronautics Board. Since then the air line stocks have roughly doubled in price and have slightly outdistanced percentage-wise the performance of the Dow Jones industrials. The chart indicates their relative action.

PROSPECTS FOR EARNINGS

The outlook for earnings in the air line industry is somewhat confused. On the brighter side, passenger revenues will increase as total traffic increases. Mail pay may not be greatly changed, perhaps down slightly, unless tonnage volume increases slightly. Freight and express revenues are likely to increase moderately. Additional revenues from these sources must meet the rising cost of operating air lines and the cost of operating the additional plane-miles that

Table 2. Domestic Air Line Operations

	Revenue, Millions of Dollars					Traffic, Millions of Ton-Miles		
Year	Total	Passenger	Mail	Freight	Express	Mail	Freight	Express
1951e	$675.0	$580.0	$40.0	$21.0	$15.0	57.8	107.0	42.5
1950	529.3	434.2	46.8	22.0	12.7	46.4	114.4	36.8
1949	464.6	381.9	45.3	18.7	9.1	40.9	96.1	27.5
1948	418.0	338.6	48.0	14.1	10.1	37.6	71.3	29.9
1947	357.4	306.3	24.4	8.7	10.6	32.9	35.6	28.6
1946	316.3	275.6	21.1	4.3	9.3	33.1	19.2	23.9

e Estimate.

will be flown by reason of the increased size of fleets. The operating costs will reflect higher pilot pay, which was placed in effect during last year on many lines, sympathetic increases in wages of other employees, and further general increases in wage costs due to the usual escalator clauses in many labor contracts. The additional Federal gasoline tax of ½ cent a gallon will be a consequential amount, and higher depreciation based on more airplanes and higher cost of airplanes will be expensive factors. The Korean Airlift may also be curtailed or terminated, and the profits that many air lines have earned from this source would be similary affected. On balance, however, barring a general recession or an unduly high number of aircraft accidents, the air line industry should be able to increase its earnings before and after taxes during 1952.

20% INCREASE IN REVENUE PASSENGER-MILES

If the industry attains a 20% increase in revenue passenger-miles, as projected above, and if 25% of this increase is attained in high-density coach planes at a tariff of 4 cents per mile and 75% in regular fare planes at an average of 5.8 cents per mile, we estimate that air lines on the average will be able to bring down 40 to 50% of the additional passenger revenues to net operating income, if we assume a passenger load factor of 65 to 70%. This figure assumes that the high-density coach traffic will be confined principally to the longer-haul segments. It allows for the increased direct operating costs of flying the additional airplane-miles required to fly the projected increase in traffic, plus an allowance for additional indirect operating costs of not less than 10% of the additional direct operating costs, and an increase in the level of costs in 1952, both direct and indirect of about 5% over 1951.

PROJECTING EARNINGS INTO 1952 HAZARDOUS

Obviously, projecting earnings into 1952 at this date is hazardous: it is even much more hazardous to do so into 1953 and 1954. However, merely as a rough guide at this time, we have made certain projections into 1953 and 1954, assuming a 20% increase each year in passenger traffic, and that increased available seat capacity in those years is utilized at a 70% and a 60% load factor, respectively. The same increase in direct and indirect operating costs has been assumed for each year as in 1952, but no increase in the general level of costs above the 1952 level has been projected. The results vary among individual air lines. Table 3 indicates the projections for the big four carriers in the United States and for National Airlines and Northwest Airlines.

CIVIL AERONAUTICS BOARD POLICIES

The most significant policy statement concerning the air lines was issued by the Civil Aeronautics Board on February 21, 1949, after two disastrous years of deficit operations. In its statement of policy of that date, the CAB recognized the difficulties that confronted the air lines in their development and postwar readjustment, granted retroactive mail-pay increases for many air lines and increased the mail rate for most air lines on a temporary basis, and asserted their obligation to "foster the economic soundness

Table 3. Estimated Earnings for 1951 and
Statistically Projected Increase in Earnings in 1952, 1953, and 1954

Air Line	1951	Increase 1952	1953	1954	1954 Annual Rate	Current Price
United[a]	$4.00	$0.90	$1.65	$0.35	$6.90	33 1/8
American[b]	1.35	0.20	0.35	0.55	2.45	16 1/8
Trans World[c]	3.20	0.70	1.95	1.95	7.80d	23 5/8
Eastern[f]	2.90	1.00	1.25	1.25	6.40	28 1/4
National[g]	2.59	-0.24	0.85	0.70	3.90	16 5/8
Northwest[h]	1.55	0.70	1.40	1.10	4.75	16 3/8

a Projections assume delivery of 12 new DC6B's and 27 new Convairs during 1952 and 2 additional DC6B's and 13 new Convairs during 1953.

b Projections allow for full utilization of 17 new DC6B's delivered during 1951 and for delivery of 8 additional DC6B's and 3 DC6A's in early 1953 and for 25 DC7's in late 1953 and early 1954.

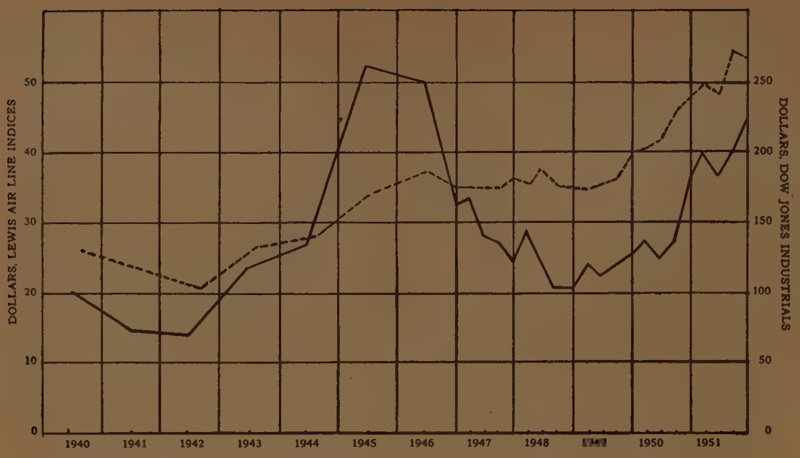
c Projections allow for delivery of 40 Martin 404's and 10 Super Constellations in 1952.

d On these projections TWA may reach excess profits tax bracket, and increase would be $1.30 for 1953 and $0.65 for 1954, instead of $1.95 in each year, and the figure in the last column would be reduced to $5.75 per common share.

f Projections allow for delivery of 60 new Martin 404's and 14 Super Constellations in 1952 and 16 additional Super Constellations in 1953.

g The projections are for National's fiscal year's ending June 30, 1951. We assume delivery of 8 DC6B's during the last quarter of 1953 and 8 Convairs CV-340 planes for late 1953 delivery.

h Northwest allows for no new equipment but does allow for an increase in traffic in line with our general assumptions.



Market Action of Lewis Indices of Air Line Securities Compared with Dow Jones Industrial Average

Average of yearly high-lows for 1940 through 1946; thereafter, closing price at end of quarters

Solid line—Lewis indices

Dashed line—Dow Jones industrials

of the individual carriers comprising the United States civil air transportation system." This was a clear indication of a policy to place the carriers on a profitable basis and constituted a basic development in the air line industry. As a result of the CAB action, the operating deficits of the air lines of some $5 million in 1946 and $20 million in 1947 were not repeated. In 1948 the total operating income of the certificated trunk line carriers in domestic service was $2.3 million; in 1949 $24.4 million; in 1950 $62.5 million; and an estimated $100 million in 1951. There is no reason to suppose that the policy of the CAB with respect to maintaining a sound air line industry, which is based on an interpretation of the Civil Aeronautics Act, will be changed, unless Congress alters the basic provisions of such Act. Such alterations are not to be expected.

EXPANSION OF LOW-FARE SERVICE

Since this statement of policy, one of the most important developments in the air transportation industry over recent years has been the expansion of low fare service embracing the family fare plans, lower excursion and round trip fares, and particularly the coach fare in high-density planes at 4½ cents per mile, compared with the standard fare rate of 6 cents per mile. In early 1949, TWA and Northwest started to operate coach-type high-density service between New York and Chicago and the West Coast. Part of the reason for this development was the inroad that nonscheduled irregular carriers, carrying passengers at roughly 4 cents per mile, was making on the traffic of the regular carriers charging 6 cents per mile. From a modest beginning this high-density coach-type service has expanded into a full-fledged basic movement in which nine certificated carriers are operating over 64 air coach schedules and serving more than 36 cities. In terms of revenue passenger-miles flown, it amounts to over 1¼ billion miles, equal to over 10% of the total traffic. For some lines, this traffic amounts to as much as 25% of their total. Moreover, the lines have been making money on this traffic, even after indirect costs are allocated to it on the same ratio to the whole system as direct costs. If the recent CAB policy dated December 6, 1951, is to be followed by the air lines, coach service at even lower rates will be expanded.

WHAT THE BOARD WANTS

In that policy statement, the CAB emphasized that the maximum development of civil aviation in the United States will not be reached until such time as air travel is placed within the economic reach of a great majority of the traveling public. It is the Board's opinion that high-density coach service can accomplish this objective. It wants:

1. The number of coach flights with high-density seating capacity to be increased.
2. The fares to be reduced below the generally prevailing minimum of 4½ cents per passenger-mile.
3. Increased low-fare, off-peak services with either normal capacity airplanes or high-density coaches at a maximum of 4 cents per passenger-mile.

ABLE TO INCREASE SCHEDULES

Under this policy the air lines will be able to increase schedules on present coach routes. With respect to service to new points, carriers will be required to furnish adequate justification for same, from both a cost and a traffic viewpoint.

REGARDED WITH SOME MISGIVINGS

This extension of the coach business is regarded by many air lines with some misgivings in that it may lead to a general reduction in the fare structure of the industry, with results comparable to the profitless years of 1946 and 1947 in the air line industry. The recent all-out revolutionary campaign of the CAB in effect disputes this theory.

LITTLE APPREHENSION ABOUT PROFIT

We do not view this development with much apprehension from the profit point of view, provided the air lines maintain close control of expenses, even though they get into the excess profits tax bracket and exercise some discrimination in instituting new coach flights. In our view, there is a tremendous market for air travel at the low coach fare rates. In 1951 there were approximately 50 billion passenger-miles of rail and bus intercity travel, almost five times the 1951 level of air travel. If one third of this travel is eliminated as potential air travel because it represents intercity travel on trips of 100 miles or less which cannot be competitively served by air, there is still a present market to be drawn on of approximately 25 billion passenger-miles, after allowing for a conversion into fewer airplane miles by reason of the shorter distances traveled thereby. Moreover, past experiences indicate that lower fares generate new travelers who had never traveled before by any means. For instance a CAB survey in 1949, on a limited scale, showed that 18.4% of travelers on coach-type planes would not have made the trip if that service had not been available. It is this type of traffic that the CAB is endeavoring to reach when the Board states that coach operations to date have conclusively demonstrated their economic soundness and "certificated domestic carriers should promptly and substantially expand their coach services."

DECIDING FATE OF IRREGULAR CARRIERS

At the same time that CAB was developing its policy of promoting additional coach service on the certificated carriers, it was deciding the fate of certain irregular air carriers, with respect to their applications for certificates of public convenience and necessity, authorizing coach-type services only on transcontinental routes without limitation. On November 7, 1951, in the Transcontinental Coach-Type Service case, the Board denied the applications of Air America, California Eastern Airways, Trans American Airways, and Great Lakes Airlines, for such certificates. In so doing, the CAB weighed the effect of new certificated carriers on existing carriers, the probable diversion of traffic and the effect of such diversion on the Federal Treasury, the ability of the existing carriers to serve the cities presently served, and the probable consequences of such additional competition in preventing the further extension of air coach services beyond the lucrative transcontinental routes to the poorer, shorter-haul traffic routes. It concluded that the granting of the applications of the respective air lines would not be in the public interest. This decision in effect relegates the irregular air carriers to limited operations permitted by CAB regulations. Our analyses have indicated that the traffic of the major irregular air carriers has been less than 5% of the total domestic business by the certificated carriers, although it has certainly been more significant on the profitable segments of long-haul operations. It is our opinion that the irregular operations permitted by the economic regulations of the CAB, together with its increased enforcement activities, limit the threat of the irregular air carriers to the certificated trunk lines. Unless the decision of the CAB is reversed by the courts, we would not be concerned about the competition of the irregulars in relation to the investment status of the certificated air lines.

ESTABLISH SERVICE MAIL-PAY RATES

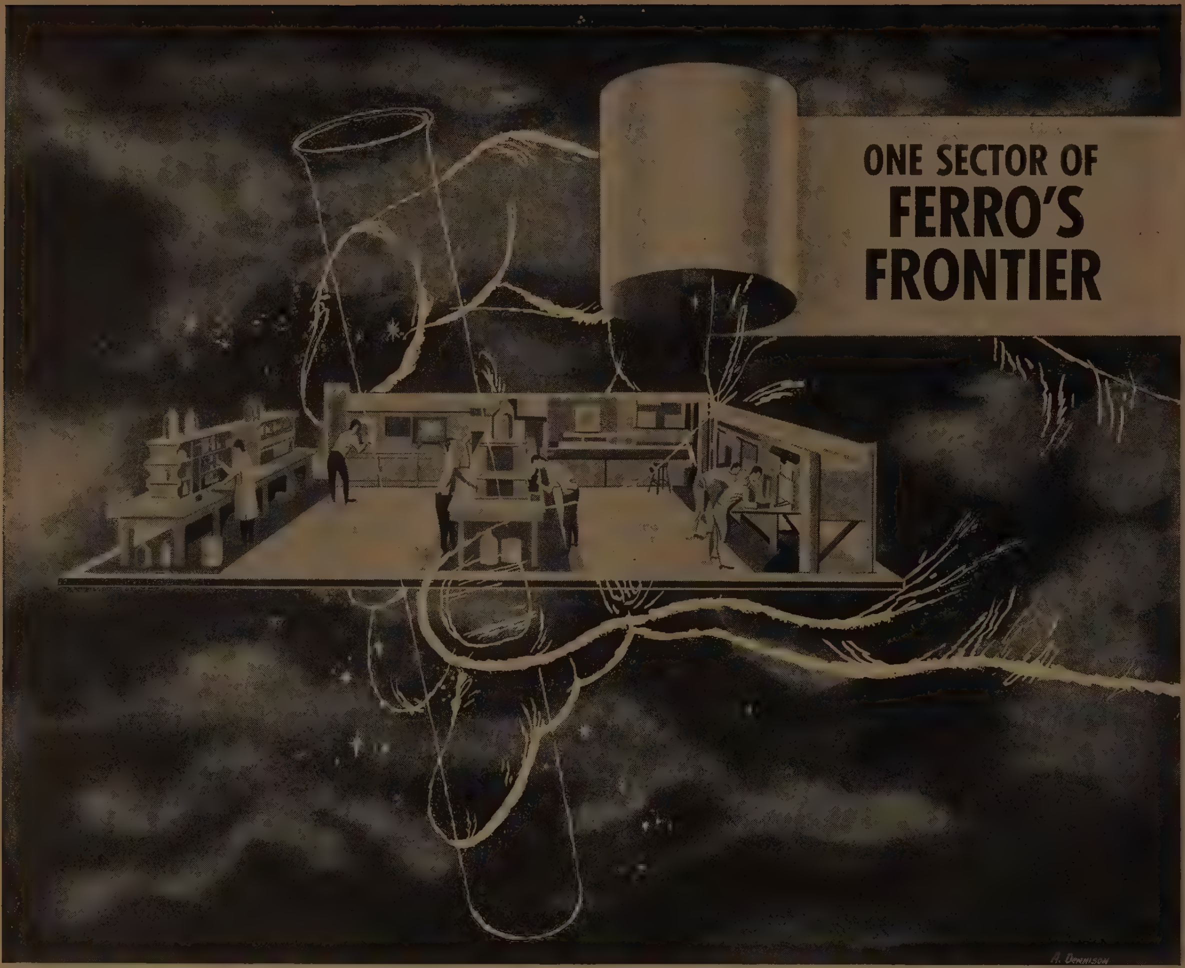
The CAB has also acted during 1951 to establish service mail-pay rates for the big four: American Airlines, Eastern Airlines, Trans World Airlines, and United Airlines. In its statement of July 31, 1951, regarding this matter, it proposed rates, based on the actual cost of carrying the mail plus a return on the investment, of 45 cents per mail ton-mile. This rate is not expected to affect the air lines adversely and offers a stabilizing prospect which should improve the investment status of the air line industry. Moreover, on October 1, 1951, the CAB announced that it had affected an administrative separation of service mail payments from subsidy mail payments for the domestic certificated air carriers. This policy sets forth estimates of the service rates per mail ton-mile for each domestic air line, ranging from 45 cents for the big four, as established on September 19, 1951, to 75 cents for the smaller trunk lines, and to even higher rates for the feeder lines. Unless this administrative separation of the service and subsidy mail pay affects the exemption from excess profits taxes granted to air lines in the amount of mail pay under certain conditions, the Board action should have no material adverse effect on the investment standing of the air line company.

Another basic policy of the Civil Aeronautics Board was enunciated in the Southern Service to the West case, decided January 30, 1951, in which the Board denied the application of certain existing carriers for a new transcontinental service and other new routes and stated that the air lines should enter into equipment interchange agreements for the purpose of providing adequate service throughout the country rather than endeavoring to establish new competitive routes. This decision has the effect of stabilizing the industry with respect to the route patterns in this country. Since the decision in the Southern Service case, the Board has established interchange of aircraft in lieu of route certifications for many air lines.

Also under consideration for some time has been a transfer to the feeder or local service carriers of certain cities served by the trunk line air carriers which provide only a small percentage of the revenue to the trunk line carriers but cause a large percentage of the expenses. If this suggested elimination of unprofitable stops from the trunk line carriers is effected, generally on the theory that it will aid both the trunk line carriers and the feeder line carriers, we would expect the earnings of the trunk line carriers to be increased in significant amounts by reason thereof.

SUMMARY AND CONCLUSION

The air line industry has enjoyed substantial growth since the end of World War II. Its total traffic has almost tripled since 1945, and there is reason to expect that this growth will continue. The expansion of low fares and development of high-density coach fares will be of major importance to the industry in the future. The CAB is adopting an aggressive attitude on this low fare travel. The air lines will undoubtedly endeavor to implement the Board's suggested policy, although they will probably exercise some caution in view of the difficulties that the air line industry experienced at the end of World War II when fares were reduced and profits disappeared. Provided the general level of costs can be maintained by the air line industry so that it is not caught in an inflationary spiral of rising wages and cost of materials against a fixed fare, we believe that the air line industry is approaching a point of stabilization which should make its equities increasingly attractive from an investment viewpoint. With expanded air travel, controlled costs, established service mail-pay rates, and relatively stabilized routes, the air line industry should look forward to progessive development of its large growth potentialities.



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TEAMED WITH CHEMISTRY...

Science as a Trustworthy Tool

HARRY DEANE WOLFE

SCIENCE—A FORECASTING DEVICE

ACCORDING TO WEBSTER, "Science is knowledge; knowledge of principles or facts. Specifically (science) is accumulated and accepted knowledge which has been systematized and formulated with reference to the *discovery of general truths* or the *operation of general laws.*" This writer has no quarrel, of course, with the definition. However, if we further interpret or analyze the definition, we ask ourselves: "Of what value is the discovery of general truths or the operation of general laws?" The historian may answer: "So that *all* may know the truth and that the general laws will be made available to all those interested and not confined to the few scientists who have worked in the accumulation of the facts, objects, and phenomena that comprise the general laws." Again, no quarrel! But, if we can, with the aid of mathematics, *reduce the general laws to formulas,* then any person familiar with the applicable mathematics can compute the *probabilities of the occurrence of an event.* Thus, we should be allowed to add to the Webster definition, the following: "Science can be used as a trustworthy tool for *forecasting the future* within certain known limits."

SCIENCE IN THE PAST

Many readers may quarrel with this addition to the Webster definition! For most of us have been brought up on the idea that science is "exact," "complete," "unvarying"—and certainly not to be tainted with the tinge of prestidigitation, omniscience, and crystal ball gazing. The term science has in the past been applied only to the natural and physical sciences or to similarly highly developed branches of knowledge. It has been carelessly thrown about as applicable in the fields of human relations, such as psychology, sociology, but always qualified as "social science" as distinguished from the more acceptable "science," which is still reserved for the natural and physical sciences. Science in marketing—in advertising? Horrors, no! Advertising certainly is a creative art not to be stultified by stuffy "bookworms" with slide rules, tables of logarithms, and probability curves. And what does science have to do with a "Dow theory," a Major Angus theory, a Mansfield Mills theory, "double tops," "resistance points," "intermediate swings"?

EXPAND CONCEPT OF SCIENCE

If we are allowed to call a science any economic activity, social or physical, in which we are nearly always able to make a *trustworthy forecast of future events,* then we can expand the concept of science to include *many activities* which are not now so classified. Some of you may already be saying that this writer is like the ancient philosopher who is reported to have said: "Let me define my own terms, and I will prove anything."

Men of science, as previously defined, such as astronomers and physicists, have always known that their findings were accurate only *within the laws of probabilities,* since the scientists knew that no mathematical average is "fully dressed" unless the tolerance (the amount of variation) is known. This tolerance, in mathematical terms, may be stated as the probable or standard error of the mathematical average. The probable (or standard) error may be large or small—but it always indicates the limits, plus and minus, within which the "true" figure is apt to fall. Notice the term—"the limits within which the 'true' figure is apt to fall."

ASTRONOMY MOST EXACT OF SCIENCES

We have always regarded astronomy as one of the most exact of the sciences both because it is one of the oldest sciences and because the mathematics of astronomy has been so very carefully worked out. Yet a recent measurement of the rotation period of the planet Uranus was given by two astronomers as 10 hr 50 min, with a probable error of 10 min, plus or minus; which meant—the chances were 50–50 (probable error) that the "true" rotation period was between 10 hr 50 min *minus* 10 min (10 hr 40 min) and 10 hr 50 min *plus* 10 min (or 11 hr). If we wished to be even more accurate, and, instead of using a 50–50 chance, we chose to be "virtually" (but not completely) certain and employed three standard errors, or 45 min, we could say the chances are 99 to 1 that the next rotation of Uranus would consume 10 hr 50 min *plus or minus* 45 min, or the "true" figure would be somewhere between 10 hr 5 min and 11 hr 35 min. Ponder on this for a moment, if you will! Scientists are allowed a tolerance in their forecasting, whereas security analysts may often be asked to forecast prices of selected stocks without being granted any tolerance.

MATHEMATICS BASIC TOOL

If science operates within the laws of probabilities, then any economic activity that can avail itself of the scientists' basic tool, mathematics, and can express its knowledge in formulas from which averages, properly qualified by probable and standard errors, can be computed, may properly be classified as science, or a scientific activity. We base this assertion on the definition of science as a trustworthy forecasting device. Science is willing to accept as a proper scientific endeavor its ability to forecast the rotation period of the planet Uranus within 10 min (probable error) or within 45 min (3 standard errors); hence, science is willing to accept a variation of 1.5% (10 min ÷ 10 hr 50 min) or a variation of 7% (45 min ÷ 10 hr 50 min).

MARKETING RESEARCH A SCIENTIFIC ACTIVITY

Is there then not sufficient reason to accept as a scientific activity the work of marketing research scientists who use sample data to which mathematical formulas have been applied and from whose computations the probable sales volume of a new product can be forecast within 5 to 10% of actual sales, once such a product has been launched on the national market?

ABILITY TO FORECAST LIMITS

The essence of a scientific activity is the ability to forecast the limits accurately *every time;* not occasionally. Any guesser may occasionally be right as to direction or amount, but a forecast based on scientific evidence (a mathematical average properly qualified by plus and minus limits, as defined by probable and standard errors) will always have a *predetermined* degree of accuracy based on the *risks* that one is willing to take of making incorrect decisions.

All business enterprises must forecast the future. Too few forecasts, unfortunately, are based on scientific evidence. Industrial firms accepted scientific methods in the development of new production techniques, in the installation of laborsaving devices, and in the promotion of the use of new technologies. Many of these same companies were slow in realizing the applicability of these same mathematical approaches to the solution of their many marketing problems.

POTENTIAL SALES VOLUME OF NEW PRODUCT

Forecasting the potential sales volume of a new product is essential for the sound and profitable operation of the companies marketing such products. It is an extremely complex problem, requiring for its solution the experience, judgment, and intuition of men with many years of experience in the particular company or field. However, a good market researcher, with his own special tools, can make an invaluable contribution to management by planning surveys and designing experiments that will give him valuable facts, and by scientifically using this knowledge.

How does the marketing scientist forecast national sales of a new product? Like the pure scientist working with test tubes in the laboratory, the market research scientist works with test towns in the field. He attempts to select a group, or groups, of towns that are typical of the Nation as a whole, with respect to the characteristics and factors that are considered relevant to the product to be marketed. In these towns, he experiments with several advertising and promotional campaigns and observes very critically their effects on sales. In many companies, test town operations are the proving grounds on the basis of which decisions on national operations are made. Once such decisions are made, these test towns can be used to supply valuable information on which forecasts of national sales volume will be made.

DIFFICULT TO MAKE ACCURATE FORECASTS

It is admittedly difficult to make accurate forecasts of levels of sales from test town operations. A good market researcher will, however, combine the information which he can get *reliably* from test towns with the wealth of information available for the national market. Competitive positions (that is, shares of total market for the leading brands) are generally estimated more reliably than absolute sales levels for these brands; and trends in competitive positions are perhaps most reliably estimated from test town data. The market researcher can obtain a remarkably good "first approximation" to national sales volume of a particular brand by applying trends estimated from test towns to estimates of the national market for the whole product class. The availability of only four to six months of national sales data, combined with test town data, will enable him to forecast the growth of a brand in the next two or three years. As he gets more information, he will be able to refine his estimates. But the real contribution of the market researcher comes from his scientific and, consequently, most efficient use of the meager data available to him. He can make forecasts months and, sometimes, years in advance and, thereby, enable management to make the long-range plans necessary for large-scale national operations.

SCIENCE APPLIED TO MARKETING

Mass production requires mass distribution or mass marketing. Today, and for as long as one can see ahead, more total money will be spent on the marketing of goods than on the production of these same goods. For every dollar of goods bought by the consumer during 1952, approximately 55 cents will go for marketing, while the remaining 45 cents is attributable to production costs. With the aid of science and scientific methods, an annual production of say 5 million automobiles has become more or less a standardized or routine production function. This is not to indicate, of course, that further production economies are not possible. Scientific management of production was introduced as early as the 1880's by the now well-known Frederick W. Taylor, when he commenced his epoch-making experiments in time and motion study. By gathering data (making measurements), recording averages, and computing probable and standard errors of the averages, Taylor introduced science—the ability to forecast the future accurately—into production.

CHALLENGE TO MARKETING

Compare the task of making and assembling 5 million automobiles in a relatively few factories located in a more or less concentrated area of the country, and produced in modern buildings under the most advanced scientific equip-

Distribution of Department's Time

154 Companies

Department	% of Time
Sales	73
Advertising	8
Production	6
Administration	2
Miscellaneous	11
Total	100

ment known to industry, with the chore of finding 5 million *individual buyers* located in every nook and cranny of not only the United States but of the entire world. Consider the task! Herculean, isn't it? *Now* find the buyers—not at any cost (for profits must be made), but find the buyers at the *lowest,* the most economical cost. That is the challenge to marketing! Marketing is late in joining the ranks of science—but it has made an excellent start and is now well on the way in many phases of the marketing process. Market research and marketing research (the more complete and comprehensive term) have brought to marketing the tools of the scientist—namely, the *ability to forecast the future in quantative terms.*

PROFITS MAY JUMP

If the reader is still with us, he may now well be thinking: "Whoopee, now that science has been introduced into marketing, profits of companies using the marketing science will jump by leaps and bounds—and immediately!" Could be! And for many companies this has happened. But let us not be impatient for results. Marketing is a complex operation and involves many and varied functions. Under marketing we may include the following functions: buying, selling, advertising, merchandising, transportation, storage, wholesaling, risk bearing, and credit. Quite a formidable array of jobs to get done—and each one costing money at every stage in the process of moving goods from the production line (producer) to the consumption line (consumer). There is bountiful opportunity to reduce costs far in excess of any savings now foreseeable from improvements in production. Let us hurry and get to the job—bank the savings, increase profits and dividends, expand production further to take advantage of this torrent of new and additional profits. The task? A very simple one! Apply science to marketing. Learn how to forecast the future accurately in quantitative terms.

MANY SCOFF AT SCIENCE IN MARKETING

There are many practitioners, as well as academicians, who now scoff at the idea of science (ability to forecast the future) in marketing. After all, such a complex economic activity dealing with millions of producers, distributors, and consumers can never be standardized as we have mechanized our production facilities. "How can we ever reduce marketing principles to mathematical form?" they shout! Good marketing men are born, not made, it is maintained in some circles. They have an instinct—a seventh sense for doing the right thing at the right time and piling up the profits. But give to the man with seventh sense instincts *the facts* on which he can make *accurate forecasts* of sales, or judge the effectiveness of the new advertising campaign, or decide on the best location for his plant, or on the most opportune time to buy raw materials—*that's the company to invest in for the long pull!* When the "basis for decisions" is a compound of *scientific data, plus* an able management endowed with the ability to weigh in properly the nonquantitative factors such as politics, morale, and tradition—then you have a profitable operation.

The science of marketing, or marketing research, is a very new one. Many of the first workers in the field are still living; some of them are still in their forties. Normally it takes years, generations, for a sufficient backlog of knowledge to accumulate for historical purposes. And, most importantly, it takes time for a new science to develop its methodologies and techniques. As additional young scientists enter the field, they bring with them, along with the developed methodologies, an enthusiasm to try new methods, new ways, new approaches. Most of their attempts are destined to failure since they were already discarded by the earlier scientists, but enough that is *new* and important rises to the surface to be developed later, either by the present young scientists or by later crops of young scientists. This should occasion surprise to no one who has followed developments in other sciences. For example, Newton (died 1727) combined (1) Galileo's (died 1642) *law of falling bodies* with (2) Kepler's (died 1630) *laws of the orbits of* the planets, (3) the laws of the tides, and (4) the then knowledge of the motions of the comets — and emerged with Newton's law of gravitation. Much later, Einstein (still living) developed a law of gravitation somewhat different (although now considered more correct) than Newton's law of gravitation which had endured without change for about two hundred years.

ACCESS TO LARGE SAMPLES

Unlike many of the sciences, marketing research has access to large samples, provided of course the money is available to employ large samples, whenever the need arises. With a population of over 150 million people, the size of the sample may vary from a complete census of the population (taken periodically by the government) to as few as two people. Large samples are most important for any science (a device to forecast the future) because, assuming good sampling technique for the particular purpose, *the larger the sample, the more accurate the forecast.* Scientists doing basic work in medicine and in dentistry, for example, consider themselves most fortunate when their sample contains as many as several hundred cases. A marketing research scientist can and does have available thousands of cases in a national sample with which he proposes to measure any of a multitude of marketing facts, fancies, or phenomena, including (1) the competitive consumer *brand preference* for a hair shampoo, (2) the size of the baby food market, (3) consumer knowledge of the *recently changed* advertising campaign of a cigarette company, and (4) consumer attitude toward a recent improvement in the product.

PROMISE TO POSTERITY

Assuming, then, a *proven methodology* (time will increase their number), an adequate sampling technique, and a sample drawn of such a size that any wanted degree of accuracy may be obtained, the ability to project future events in marketing is as great as or greater than that of any other science. This is the promise of marketing research to posterity. Do not expect miracles all at once. Time is needed to attract the proper man power (including women of course) to develop the necessary tools of the science, and to prove to management that decisions based on *predictable facts* can be made with confidence. Research, good research, dependable research, takes time—and *time is an important value in business.* Decisions must often be made "on the spot." There is not always time for research before the decision needs to be made. Research, obviously, cannot impede management in its decisions, for its principal function is to aid and assist management in making the proper decisions. But, in the fullness of time, major marketing decisions will be made with the guidance of marketing research (preferably before the decisions are made); both will be performed concurrently.

A FEW EXAMPLES OF MARKETING RESEARCH

Up to this point, the discussion has been purposely devoted to the general aspects of science in marketing, and of the philosophy of marketing research. Now, to put some meat on the bones! Who uses marketing research today—how do they use it—and for what purpose is it used?

I. EXAMPLES FROM NATIONAL INDUSTRIAL CONFERENCE BOARD REPORTS

The National Industrial Conference Board, in two studies, Organization for Market Research, Part I, Industry Experience (dated November 1945), and Part II, Operating Methods and Company Plans (dated August 1946), has made the most objective analysis to date of the place of marketing research in industry as of 1945–46. It is hoped that it will bring these studies up to date when time permits. Based on the replies of 154 companies, the most important functions of the market research department are listed in order of importance:

New product development (nonengineering).
Analysis of consumer market (including industrial).
Estimating of potential sales (general).
Competitive position of company's products.
Sales methods and distribution policy.
Customer preferences.
Market analysis by areas.
Competitive conditions in markets.
Improvement of present products.
New uses for old products.
Relative profitableness of markets.
Estimated demand for new products.
Market analysis by customer.
Distribution costs.
Sales methods or devices.

FUNCTIONS PERFORMED BY SALES DEPARTMENT

A casual glance at this list will reveal that most of the items concern themselves with functions normally *performed by the sales department of the company.* As a matter of fact, almost 75% of the reported time of the average market research department was devoted to assisting the sales department.

It was only natural that marketing research should find its first mark in the sales department of the company for the following basic reasons:

1. The early techniques known were especially adaptable to sales problems.
2. Large samples were readily available from company records and from outside sources.
3. U.S. Census material supplied essential benchmark data so necessary for confirmation of the computed data.

POSSIBLE TO DELINEATE SALES ACCURATELY

Expert mathematicians rigorously applied their mathematical knowledge to the computation of market potentials. With imagination to experiment with all of the factors pertinent to the sales of individual commodities, and employing advanced mathematical techniques, it became possible to delineate accurately (within known limits) expected (potential) sales from each sales unit, whether the unit was as small as a trading area or as large as a complete sales division. As the mathematicians became more proficient in the development of their techniques, they developed the concept that there was a variance in the acceptability of certain products in certain areas, quite apart from *economic factors.* They sharpened their tools and found ways of further improving the accuracy of their forecast. "Selling bathing suits to Eskimos" is a derisive expression known to all of us. And you wouldn't think that experienced marketers would try it. But many of them don't use much more imagination than this in their selling and advertising plans. Why? Because they do not know as accurately as they can the size of their markets in Florida, in Wisconsin, and in Alaska. If a certain area needs only 4% of your marketing effort for one product, 6% for a second product, and, say, 8% for a third product, why not try so to apportion your time and money as to get the maximum profit from *each territory* for *each product.*

II. EXAMPLES TAKEN FROM THE PRICING OF INSURANCE

The application of science to marketing problems has been most highly developed in the form of *actuarial science,* which has been developed for the solution of insurance problems. Broadly speaking, the very important problem of pricing insurance is a *marketing* problem, inasmuch as it involves the pricing of a commodity. When an individual is insured by a company, he and the company agree to a written contract, or *policy.* The basic problem is to determine the *premiums* (or price of the insurance contract) which should be charged a policy holder in return for the promised benefits under his policy. The pricing of life insurance depends on three factors: (1) the rate of mortality, (2) the rate of interest that can be earned on investments, and (3) the rate of expense incurred by the company.

PROBABILITY BASIS OF ESTIMATION

The mathematical theory of probability is the basis for the estimation of the *rate of mortality,* or the probability that a person of a given age will die within a year. Now, no prediction can be made with confidence about the time of death of an individual. However, the experience of large numbers of individuals (just as in many marketing problems) and the scientific use of this experience enable insurance companies to estimate quite closely the number of persons out of a given large group that will die within a year. It is this ability to make forecasts for large numbers of individuals that enables insurance companies to operate on a sound and profitable basis. Losses on individual policies are expected, but these are offset by profits on others;

and there is a distribution of these losses over the whole group. To make a comparison with other marketing problems where the scientific approach may be *fully* utilized, some of the decisions will be incorrect, but we will know in advance what percentage of our decisions will be incorrect, depending on the degree of accuracy that is desired.

PRINCIPAL SOURCES OF INFORMATION

The principal sources of information are general population statistics obtained from the Census and the mortality records of life insurance companies. The use of past experience to forecast future events is, of course, based on the assumption that the mortality experience of the future will duplicate that of the past; and this assumption is a particularly safe one when large numbers of items are involved.

RELATION OF THE CONCEPTS EXPRESSED IN THIS ARTICLE TO THE WORK OF THE SECURITY ANALYST

In 1929 our gross national product was about $100 billion, in 1951 the amount had more than tripled to over $300 billion, and there is a possibility of a $500 billion economy in the near future. These stupendous figures imply a tremendous, even staggering, burden to marketing management. Marketing costs will make up a major share of the total dollars spent by the consumer for goods and services. The success or failure of many companies will depend on the intelligence with which they apply science to their marketing problems. Many companies in the past have flown from "the seat of their pants" because their competitors have used similar *although outmoded* directional methods. When a competitor begins using completely equipped panel boards for direction, beware of the company still "flying from the seat of its pants."

SOME DO NOT SEE NECESSITY

Complete industries may not yet see the necessity for science in marketing. Look carefully at these industries. As our total gross national product rises, the percentage of the total needed for subsistence declines; the surplus, now being called "discretionary spending power," is available for expenditure on a variety of goods and services, not needed to "keep alive." Alert industries, conscious of the need for and the power of science in marketing, might get preference for the consumers' dollars over "horse and buggy" industries not quite fully awake to the sales potential of their various markets.

AN UNBROKEN RECORD OF *Dividends Declared*

ABBOTT LABORATORIES
NORTH CHICAGO, ILLINOIS
Manufacturing Pharmaceutical Chemists since 1888

TRADED
1929 Chicago Stock Exchange
1937 New York Stock Exchange
1949 San Francisco Stock Exchange
1949 Midwest Stock Exchange

3,739,814 Shares of Common Stock Outstanding • NO BONDED INDEBTEDNESS
106,851 SHARES 4% CUMULATIVE PREFERRED STOCK OUTSTANDING

ANNUAL DIVIDENDS

1951	1.95	
1950	1.85	
1949	1.80	1949—Adjusted on basis of 2-for-1 stock split
1948	3.40	
1947	3.25	
1946	2.87	1946—2-for-1 stock split and rights
1945	2.20	
1944	2.20	1944—rights voted
1943	2.00	
1942	1.90	
1941	2.15	
1940	2.15	
1939	2.05	1939—5% stock dividend and rights
1938	1.70	
1937	2.10	
1936	2.07	1936—3-for-1 stock split
1935	2.45	1935—33⅓% stock dividend
1934	2.50	
1933	2.00	
1932	2.12	
1931	2.50	
1930	2.00	
1929	2.42	

*ON BASIS OF TOTAL NUMBER OF SHARES OUTSTANDING AT THE CLOSE OF EACH YEAR.

The VALUE that cannot be measured...

This is the time of year when The Home Insurance Company reports on its operations and progress for the previous year. In so doing, as you will note, we list the physical assets of the company.

One of our most fundamental assets, however, cannot be listed and evaluated in dollars. That asset is the close bond of personal interest and friendship that has always existed between The Home and the policyholders it serves.

This asset has a threefold source. In part, it springs from the very nature of the business in which The Home is engaged. No field of activity is more deeply personal than the field of property insurance . . . the protection of a man's home, his business, his cherished possessions. Another underlying stimulus of this friendly relationship is the natural concern any policyholder feels regarding the company which provides him protection, and his loyalty to a company which proves itself worthy of loyalty. The third source lies in the whole business philosophy of The Home and its more than 40,000 agents and representatives . . . a warm and human way of doing business on the directly personal level; a relationship of *people* with *people*—people supplying service to people with a need for that service.

To the stockholders who own The Home, no asset is of greater value. Every premium payment, every policy, every claim and every benefit that make up the story of The Home for 1951 is a direct outgrowth of that bond of friendly interest.

It is the foundation on which The Home builds.

Sincerely,

PRESIDENT

Balance Sheet

ADMITTED ASSETS	December 31, 1951
United States Government Bonds	$ 94,712,097.11
Other Bonds	61,066,023.83
Preferred and Common Stocks	137,331,389.75
Cash in Office, Banks and Trust Companies	34,525,001.17
Investment in The Home Indemnity Company	16,775,982.44
Real Estate	6,804,977.76
Agents' Balances or Uncollected Premiums	19,562,958.04
Other Admitted Assets	4,154,929.80
Total Admitted Assets	$374,933,359.90
LIABILITIES AND CAPITAL	
Reserve for Unearned Premiums	$163,843,315.15
Unpaid Losses and Loss Expenses	33,259,160.83
Taxes Payable	7,500,000.00
Reserves for Reinsurance	1,783,086.36
Dividends Declared	3,600,000.00
Other Liabilities	4,596,351.05
Total Liabilities	$214,581,913.39
Capital Stock	$ 20,000,000.00
Surplus	140,351,446.51
Surplus as Regards Policyholders	$160,351,446.51
Total	$374,933,359.90

NOTES: Bonds carried at $5,514,759 Amortized Value and Cash $80,000 in the above balance sheet are deposited as required by law. All securities have been valued in accordance with the requirements of the National Association of Insurance Commissioners. Based on December 31, 1951 market quotations for all bonds and stocks owned, the Total Admitted Assets would be $371,808,657 and the Surplus as Regards Policyholders would be $157,226,744.

Directors

Lewis L. Clarke
Banker

George McAneny
Trustee,
Title Guarantee & Trust Company

Harold V. Smith
President

Frederick B. Adams
Chairman of Executive Committee,
Atlantic Coast Line Railroad Co.

Robert W. Dowling
President,
City Investing Co.

George Gund
President,
Cleveland Trust Co.

Harold H. Helm
President,
Chemical Bank & Trust Co.

Charles A. Loughin
Vice President & General Counsel

Ivan Escott
Vice President

Percy C. Madeira, Jr.
President,
Land Title Bank & Trust Co.

Earl G. Harrison
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President,
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George A. Fuller Co.

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Leonard Peterson
Vice President & Controller

Herbert A. Payne
Vice President & Secretary

J. Edward Meyer*
President,
Cord Meyer Development Company

*Elected January 14, 1952

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INSURANCE

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Population and Security

CLYDE V. KISER

WORLD SETTING

THE HISTORY OF OUR COUNTRY falls within a period of phenomenal growth of world population. According to the best evidence available, the total population of the world had been fairly stationary around the one-half billion level for many centuries prior to 1650. During the three centuries since that date, only an instant in man's history, the world's population increased more than fourfold, and it is now about 2.4 billion.

The great increase in the world's population during the past three centuries is commonly attributed to a matrix of changes brought by the discovery of new lands; by the commercial, agricultural, and industrial revolutions; and later by the advances in medicine and public health. These changes had their first and heaviest impact on people of European origin, and, while these people have increased some sevenfold since 1650, those of non-European origin have increased only about threefold.

It is important to note, however, that the potentials for future growth are much higher among the people of non-European than among those of European origin. This may be seen from a brief consideration of the mechanics of past population growth. This growth has arisen not from increase in birth rates but from reduction in death rates. Modernization tends eventually to lower, rather than to raise, birth rates. But it brings a lowering of death rates long before it brings declines in birth rates. Hence, for a period, there is an expanding rate of natural increase (excess of birth rate over death rate), and this gap continues until the birth rates finally fall to the approximate level of the death rates.

Hence, if one may judge by the past, the population growth that follows modernization tends to be a "growth wave" rather than a permanent situation. It is the consequence of a transition, from a population kept virtually stationary, because high birth rates are canceled by high death rates, to a population that is kept stationary, because both birth rates and death rates are low. Some of the most advanced countries have virtually completed this transition, other countries are in midstream, and still others (some of the so-called underdeveloped areas) have scarcely begun it.

This article could well be devoted exclusively to problems of world security inherent in the differential timing of the transition from high to low birth and death rates. However, since we are concerned mainly with domestic population trends, this introduction will simply emphasize the importance of finding ways and means of narrowing the time interval between declines in the death rate and declines in the birth rate. European peoples required three centuries to make the transition, and they had the benefit of new continents on which to settle during their periods of rapid growth. The efforts at modernization of underdeveloped areas are coming at a time when migration opportunities are severely limited. Some of these areas, as South America, can accommodate large increases in population. Others, as Asia and the South Pacific, are already densely settled. The peoples in underdeveloped areas of dense settlement must inevitably choose sooner or later between fertility control and continued control of numbers through recurrent famine and the grim reaper. There can be little hope for world peace and security as long as the latter course is continued.

THE UNITED STATES

Even within the setting of rapid expansion of all peoples of European descent, the population growth of the United States has been outstanding. Ours, of course, has been a new country in the process of being filled up, partly by immigration. Furthermore, the expansion of the area making up the United States is a very important factor. At the time of Independence, the United States consisted of thirteen States on the Atlantic Seaboard, and the area has subsequently expanded westward to the Pacific and southward to the Gulf.

Even after the expansion of area has been taken into account, however, population growth has been phenomenal. Only 3.9 million people were enumerated in our first Census of 1790. About 150.7 million were counted in the Census of 1950. Thus the population increased 38-fold over a period of 160 years. The rate of increase, however, has by no means been uniform. The increase per decade was about 35% from 1790 to 1860, about 26% from 1860 to 1890, 21% from 1890 to 1910, 15% from 1910 to 1920, 16% from 1920 to 1930, 7% from 1930 to 1940, and 14.5% from 1940 to 1950. The conspicuously low rate of growth during 1930–40 reflects the sharp drop in the marriage and birth rates during the depression '30's. The equally conspicuous rebound of the rate of growth during the '40's (representing a population increase of 19 million) reflects the sharp rise in marriage and birth rates associated with defense, wartime, and postwar conditions, a matter that we will discuss later.

INTERESTING DIFFERENCES

There are interesting differences among the various areas and elements of the population in rate of growth from 1940 to 1950. By region, the percentage increase was highest for the West (41%) and lowest for the Northeast (10%). It was 11% for the North Central region and 13% for the South. California outranked all states with a 53% increase in population. She now stands second to New York in population size; in 1940 she was in fifth position.[1]

At this point it should be emphasized that, although final figures from the 1950 Census have been released for the total population and for geographic areas such as regions and states, the figures for the remaining subdivisions of the population discussed in this report, such as those by urban-rural residence, color, nativity, and age, are based on sample data and are subject to change in the final tabulations.

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[1] References appear at end of article, page 56.

Changes in definitions of urban, rural nonfarm, and rural farm groups were initiated in the 1950 Census, and wholly satisfactory comparisons of 1940 to 1950 trends in the size of these groups are not yet available. However, preliminary sample tabulations yield an increase of about 19% from 1940 to 1950 in the population considered "urban" according to the 1940 definition and an increase of only 7% in the population considered "rural" by the 1940 definition. The higher rate of growth of the urban than of the rural population is presumably due mainly to rural-urban migration. The natural increase (excess of births over deaths) is higher in rural than in urban areas. Although the preliminary sample tabulations under the old definitions include no breakdown of the "rural" group into "nonfarm" and "farm" subgroups, the Bureau of the Census and the Bureau of Agricultural Economics estimated that the civilian farm population declined about 7.5% from April 1940 to April 1949.[2, 3]

In the country as a whole, the percentage increase was somewhat higher for females (15.9) than for males (13.0). It was a little higher for nonwhites (15.1) than for whites (14.4). Negroes alone increased 15.8% (or from 12.9 to 14.9 million in actual numbers), whereas the "other colored" population declined a little, according to the preliminary reports. Foreign-born whites *decreased* 11.1% over the decade, and their numbers were reduced from 11.4 million in 1940 to 10.1 million in 1950.[4]

By age, the most conspicuous increases were at the two extremes. Thus the number of children under 5 increased about 55%, and the number of persons 75 years of age and over increased 45%. Children under 5 at the time of the Census (April 1, 1950) were largely the survivors of the bumper crop of babies born after demobilization in 1945. In 1940 there were only 10.5 million children under 5; in 1950 there were 16.3 million, or an actual gain of 5.8 million. The number of children 5 to 9 years of age also increased heavily during the decade; the number was 10.7 million in 1940 and 13.2 million in 1950, a gain of 24%. In contrast, the number of children 10 to 14 declined 3%, youngsters 15 to 19 declined 13%, and those 20 to 24 declined 2% during the decade. These are the only five-year age groups exhibiting a decline in numbers. It will be noted that persons 15 to 19 in 1950 are the survivors of the slim crop of babies born during the depression years of 1930 to 1934.

Above-average percentage increases in population from 1940 to 1950 were exhibited by all age groups of 55 and over. The 55 to 64 group increased about 25%, the 64 to 74 group about 33%, and, as already stated, the number 75 and over increased about 45%. The actual number of persons 65 and over, commonly called the "aged," was about 9.0 million in 1940 and 12.3 million in 1950.[5]

CHANGING DISTRIBUTION AND COMPOSITION

As a result of the differential rates of change we have described, interesting changes have occurred in the distribution and composition of our population These may be described briefly along several lines.

Regional Distribution. By region, the increasing proportion of the population in the West is significant. In 1900 only 5% of the Nation's people were in the West, 32% in the South, and 62% in the North. In 1940 the proportions were 11, 32, and 58%, respectively, and in 1950 they were 13% for the West, 31% for the South, and 56% for the North.[1]

Color. The conspicuous shift of the Negro population away from the South is shown by the figures for the Negroes alone. Thus in 1900, 10% of the Negroes were in the North, 89.7% in the South, and 0.3% in the West. In 1940 the percentages were, respectively, 21.7, 77, and 1.3. In 1950 approximately 27.6% of the Negroes were in the North, 68.5% in the South, and 3.9% in the West.[6]

In 1790 the Negro population, numbering only 757,208, comprised about one fifth (19.3%) of the total population in this country. This percentage decreased with each successive census until that of 1930 when it was 9.7%. However, the proportion rose to 9.8% in 1940 and to 9.9% in 1950. The slower growth of Negroes than of whites before 1930 was due partly to the higher death rates among this group and partly to the fact that augmentation of this group through immigration was negligible after 1808 when Federal law banned the importation of slaves. The slight gain in proportion of Negroes since 1930 probably arises mainly from the delayed gains in health conditions among Negroes.

Nativity. The number of foreign-born whites in this country increased with each successive census from that of 1850 (when there were approximately 2.2 million) to that of 1930 (when the number was about 14.0 million) and then declined to 11.4 million in 1940 and 10.1 million in 1950. By definition the foreign-born group is increased only by immigration. Hence, it is not surprising that, even in 1910, foreign-born whites constituted only 14.5% of our total population. This group formed about 13% of the population in 1920, 11% in 1930, 9% in 1940, and 7% in 1950.[4, 7] Barring an unforeseen liberalization of our immigration policy, the number and proportion of our foreign born will decrease even more rapidly in the future, because this group is already heavily concentrated in the older ages.

Urbanization. The rapid growth of our population since 1790 has been accompanied by a marked urbanization. In 1790 only about 5% of the people of this country lived in urban areas, that is, towns of 2,500 population or more. The proportion was 15% in 1850, 46% in 1910, 51% in 1920, 56% in 1930, and 56.5% in 1940. As already indicated, the definition of "urban" was made more inclusive in 1950, and about 64% of the people were classified as urban under the new definition. Under the old definition, approximately 59% of the 1950 population would be classified as urban.

In 1920 when the rural farm population was first delineated in the census, 30% of the people were so classified. This proportion dropped to 25% in 1930, to 23% in 1940, and (under the new definition) to 16% in 1950.

The trend toward urbanization of the Negro has been especially marked. Thus, in 1890 only about 19% of the

Negroes were classified as urban. The proportion was 27% in 1910, 34% in 1920, 44% in 1930, 49% in 1940, and (under the new definition) 61% in 1950 Only 21% of the Negroes were classified as rural farm in 1950.[4]

Age. As a result of past declines in birth and death rates, the aging of our population, as in other advanced countries, has been a conspicuous feature of our demographic history. The trend can be summarized by reference to four broad age groups: under 20, 20 to 44, 45 to 64, and 65 and over. These groups are frequently called, respectively, "children and youth," "the younger working force," "the older working force," and "the aged." The "children and youth" (or under 20) category included almost 50% of our population in 1870, 44% in 1900, and 34% in 1940 and 1950. It may be noted from the age pyramids in the accompanying chart, however, that, although the total proportion of persons under 20 was about the same in 1950 as in 1940, the internal age structure of this group at the two periods is quite different. In short, the proportions of children under 5 and 5 to 9 were much higher in 1950 than in 1940, but the proportions of children 10 to 14 and 15 to 19 (the survivors of the small crop of children under 5 and 5 to 9, respectively, in 1940) were much lower in 1950 than in 1940. The net result was that the long-time decline in total proportion of persons under 20 was halted but not reversed in 1950.

The 20 to 44 age group (the so-called younger working force) has undergone little change in proportionate importance. This group comprised 35% of the population in 1870, 38% in 1900, 39% in 1940, and 37% in 1950.

In contrast, the 45 to 64 age group, the older working force, has increased rather steadily. This group constituted 12% of the population in 1870, 14% in 1900, and 20% in 1940 and 1950.

More striking have been the increases in the proportion of persons 65 years of age and over. This proportion was 3% in 1870, 4% in 1900, 7% in 1940, and 8% in 1950. Students have estimated that this proportion will be about 11% in 1975 and 13% in 2000.

COMPONENTS OF POPULATION CHANGE

The three determinants of changing size of the total population of any country are births, deaths, and net gains or losses from immigration and emigration. As for our own country, the last-mentioned factor has been a negligible one in population growth since the enactment of the quota laws of the '20's. Although the future may bring some liberalization in our immigration laws, there is at present little to indicate any readiness on our part to open the gates much wider than they now stand.

Furthermore, although declines in death rates have been a very important factor in the past growth of our population, we probably cannot look for much future growth of population from this source. The past growth from this source has arisen from increases in average length of life, and this in turn has been accomplished mainly by the control of infant mortality and the contagious and infectious diseases affecting children and young people. Thus, the infant mortality rate in this country fell from an estimated 125 (deaths of children under 1 per 1,000 live births) in 1900 to 29 in 1950. Deaths from whooping cough, scarlet fever, measles, and diphtheria have been practically eliminated. In 1900 tuberculosis was the leading cause of death, and there were about 195 deaths per 100,000 population from this cause; in 1948 tuberculosis was in seventh place, and the rate was about 29. Likewise, the death rate from pneumonia has been reduced to less than one-fifth its magnitude in 1900. Even at this earlier date, the great pestilences of the former years (cholera, yellow fever, smallpox) had been virtually conquered.

In contrast, relatively little progress has been made in the conquest of the so-called chronic diseases associated with old age. This problem has become a gigantic one because of the increasing numbers and proportions of the people in the old-age group. The very success in preventing deaths at young ages has resulted in more people reaching the age at which they become particularly subject to heart diseases, cancer, and other illnesses associated with old age. In consequence, there have been marked increases in annual deaths from these diseases per 100,000 of the total population. Thus, the recorded death rate from diseases of the heart increased from 137 in 1900 to 295 in 1948. In the former year these diseases ranked fourth from the top as causes of death; they now top the list by far. Likewise, the death rate from cancer increased from 64 in 1900 to 125 in 1948 and this disease advanced from eighth to second rank as a cause of death.[8]

It should be emphasized that the above rates are not adjusted for changing age structure of the population and that much of the increase noted arises simply from an increasing proportion of old people. Other important factors are the improvements in *reporting* and also the improvements in accuracy of diagnosis. Some evidence of recent declines in age-specific death rates from heart diseases and cancer may be found in data for selected areas and groups.[9]

Although reductions in the death rates among the older persons will serve to increase the number of the aged, the impact on the size of the total population probably will not be very important. Furthermore, there is very limited prospect for future increase of population through declines in mortality below age 45. The extension of the expectation of life at birth among white females in the United States from 51 in 1900 to 71 in 1948 was achieved largely by reductions in mortality among people under 45. The potential increase in population from this type of advance is implicit in these figures themselves. The expectation of life at birth simply means the average number of years of life per person born if the cohort of births is subjected to existing age-specific mortality rates. Another way of putting it is that, under conditions of mortality prevailing among white females in this country in 1900, 1,000 births per year eventually would yield a standing population of 51,000, whereas, under the mortality conditions of 1948, 1,000 births per year eventually would yield a population of 71,000, a potential increase of 39%. According to Notestein, "Even if there were no deaths at all before age 45 among white females in the United States, 1,000 births a year would support a population only 6 per cent larger than the 71,000 figure given above, assuming that the death rates of people above 45 were not reduced."[10]

The foregoing reasons underlie the previously stated assumption that, like immigration, mortality conditions will constitute a fairly stable variable in the population equation of the foreseeable future. This, of course, rests on the further assumption that there will be no catastrophic pollution of our water supplies and no breakdown of our sanitation and food distribution systems: in short, that there will be no war.

Fertility. Probably the most important, and certainly the most uncertain, component of future population change is that of the fertility rate. This is the least predictable because, with increasing spread of contraception, the trend of the fertility rate perhaps will be governed more and more by individual decisions on whether to have or not to have a child or more children. Until 1933 there had been a virtually steady decline in the birth rate in this country for over a hundred years. Our national birth registration area was not established until 1915 and did not include all states until 1933. However, on the basis of fertility ratios (number of children under 5 per 1,000 women 20 to 44 years of age), Thompson and Whelpton have estimated that in 1800 and 1810 there were approximately 55 births per year per 1,000 white population and that this rate had fallen to about 43 by 1850 and to about 30 by 1900.[11] The birth rate for whites and nonwhites combined, corrected for underregistration and adjusted to the country as a whole, declined from an estimated level of 29.5 in 1915 to 18.4 in 1933. In the preceding year (1932) marriage rates had reached their lowest point on record as a result of the economic depression. A slow and irregular increase in marriage and birth rates accompanied the gradual economic recovery during the latter part of the '30's, and by 1940 the birth rate stood at 19.4. Thereafter the stimulus of defense economy and our entrance into the war brought sharp increases in marriage and birth rates. The birth rate reached a wartime high of 22.9 in 1943 and then, because millions of men were overseas, dropped to 20.7 in 1945. The next year, as a result of demobilization, marriage rates reached their highest point on record, and the year 1947 witnessed a birth rate of 27.0, the highest since 1921. The birth rate subsequently declined to 25.4 in 1948 and 25.1 in 1949.[12]

As already noted, the baby boom resulted in 8.3 million more children under 10 years of age in 1950 than in 1940. However, because of the low birth rates during 1930 to 1935, we had about 1.6 million fewer children 15 to 19 years of age in 1950 than in 1940.

In view of such past changes, there is naturally much interest in the future course of the birth rate. P. K. Whelpton's studies have indicated that a large part of the increase in the birth rate since 1940 has been due to increases in first and second births. As a result of the depression, huge numbers of couples postponed marriage and children until after 1940. Then, with the previously described conditions of the '40's, not only were these postponed marriages and births "made up," but also there was an apparent "moving ahead" of marriages and births by the younger people. Thus, there was a concentration of marriages and births that more normally would have been spread out over a wider time span.

In his study *Cohort Fertility: Native White Women in the United States* (to be published by the Princeton University Press), Whelpton attempts to trace the fertility and mortality experience of successive annual cohorts of native-white females. The analysis relates mainly to successive cohorts of women born from 1890 to 1930; that is, those born in 1890 are one cohort, those born in 1891 are another cohort, and so on.[13] Whelpton emphasizes that his findings must be regarded as approximations rather than as exact because it was necessary to make various types of estimates in the processing of the data. These data do suggest that the average size of completed family may be somewhat higher for the cohorts of native-white women born in 1910 to 1914 and 1915 to 1919 than for those born in 1905 to 1909. In other words, the long-time downward trend in average size of completed family probably is undergoing at least a slight and temporary reversal. Although women born in 1920 to 1930 had gotten off to an auspicious start in fertility by 1949 (the last calendar year considered), there is as yet insufficient basis for ascertaining whether these younger cohorts will continue the upward trend in average size of family.

Some basis for doubting that any substantial and sustained increase in average size of completed family is in the offing is afforded by Whelpton's computations of probabilities of birth of given orders during specific calendar years among native-white women of given age and *at risk* of having the given order of birth at the beginning of the calendar year. The probabilities are computed, say, by relating the number of fourth births during the year to women who had borne three children before the beginning of the year. It was found, for instance, that the probability of first births to childless women at age 20 was over twice as high in 1947 as in 1933. The same can be said with reference to probability of first births among childless women attaining age 25, 30, and 35 on January 1, 1947, compared with those reaching these ages on January 1, 1933. Likewise, although the relative excess is smaller, the probabilities of second and third births were rather universally higher in 1947 than among women of comparable age in 1933 or 1940. However, the probability of fourth or fifth births to women at risk at age 25 was definitely lower in 1947 than in 1933 or 1940. The probability of fourth births to women at risk at age 30 was practically the same in 1933, 1940, and 1947. The probability of fifth births to women at risk at age 30 was lower in 1947 than in 1933 and 1940. However, the probability of fifth births to women at risk at age 35 was slightly lower in 1940 than in 1933 but regained its 1933 level by 1947. These examples are sufficient to indicate the reasons for the uncertainty regarding future trends in average size of family.

The question may arise concerning the extent to which various classes of the population participated in the baby boom of the '40's. From the data available at present, it appears that the increases in the fertility ratios tended to be highest among groups that were characterized by lowest fertility in 1940. Utilizing the previously mentioned preliminary age distributions from the 1950 Census, we find that percentage increases from 1940 to 1950 in the ratio of children under 5 born to women 15 to 49 years of age (45% for the country as a whole) differed substantially.

Of importance to workers in financial fields are the following statistics: By region, the increase in fertility ratios was 57% for the Northeast, 50% for the North Central States, 54% for the West, and 30% for the South. By type of residence, the increase was 69% for the urban population, 37% for the rural nonfarm, and 22% for the rural farm, but it must be remembered that the 1950 changes of definition of these three categories prohibit close comparison of 1940 to 1950 trends by residence. By color, the over-all increase in fertility ratios was 46% for whites and 39% for nonwhites. However, the higher over-all increase for whites than for nonwhites appears to arise entirely from differences in type of residence, by color. Among urban, rural nonfarm, and rural farm populations considered separately, the percentage increases in fertility ratio were higher among the nonwhites than among the whites.

For an analysis of 1940 to 1950 trends in fertility by such factors as education, we must await tabulations from the Bureau of the Census. However, according to a census release of 1948 based on samples of households included in the Current Population Survey, the 1940 to 1947 percentage increase in fertility ratios among married women was highest (34%) for wives reporting four or more years of college and lowest (12%) among those reporting only five to six years of grade school. The increase was 13% for wives with less than five years of formal schooling. Except for this minor irregularity, the direct relation of the increase in fertility ratio to educational attainment was consistently exhibited.[14]

Despite the rather marked trend toward a narrowing of group differences in fertility ratios since 1940, the areas and groups exhibiting highest and lowest fertility ratios in 1940 apparently still did so in 1947 and 1950. Thus in 1940 the fertility ratios were 227, 359, and 430 for the urban, rural nonfarm, and rural farm groups, respectively. In 1950 the corresponding ratios were 383, 492, and 526. Similarly, in 1950, as in 1940, the Northeast was still characterized by lowest fertility ratios and the South by the highest. In 1947, as in 1940, the lowest fertility ratios were found among wives of college status and the highest among those with least education. Furthermore, it may well be that the previously described "postponing," "making up," and "moving ahead" of marriages and births were simply more characteristic of the urban and educated classes. If this is the case, the marked narrowing of differentials in fertility ratios since 1940 may be highly temporary.

IMPLICATIONS FOR SECURITY

Several aspects of our population trends bear on different types of "security." First of all, with respect to manpower potentials for military service, it may be noted that in 1950 we had 22.4 million males 15 to 34 years of age and an additional 10.5 million 35 to 44 years of age. That the number of males 15 to 34 was only a little larger in 1950 than in 1940 arises from the fact that the relatively slim crop of depression babies, those born during the '30's, were those approaching and entering military ages in 1950. However, close behind the "depression babies" are the larger cohorts of males born during the '40's. Furthermore, as women readers of this article may well point out, the last war made it abundantly clear that neither military service nor work in munition plants is any longer a prerogative of the males alone, and we have a ready supply of "woman power" as well as "man power" for both purposes.

It is recognized, of course, that population is by no means the chief determinant of national power. In countries like India and China, the huge numbers of underfed people probably are sources of national weakness rather than of strength. The complexity of the components of national power is suggested by the Sprouts' statement that "Manpower plus economic resources plus tools and skills plus organization plus morale equals power potential which, given time, can be transmitted into power in being."[15] Perhaps to this could also be added the ability to secure the co-operation of other countries.

Other facets of security problems emerge in consideration of specific age groups. From a long-time standpoint, probably no problem is more important than the provision of adequate facilities for health and education of children. Our gain over 1940 of 8.3 million children under 10 years of age has resulted in overcrowding of schools, and the task for school administrators and community leaders all over the country is made more difficult by the lack of knowledge as to whether this increase is more than a temporary wave. Another aspect of the general problem of child welfare is that an undue proportion of our children are being reared in areas and among families where levels of living are lowest and where the opportunities for health and education are most meager. This holds true, despite the fact that, on a relative basis, the increases in birth rates during 1940 to 1950 appear to have been highest among groups having fertility under control. It seems likely that the high rate of rejections for military service in the last war and at present is one tangible result of our past indifference to problems of child welfare in rural areas of high fertility. In the past we have been prone to leave these matters to local areas, but there is now an increasing realization that the status of children is of national concern and that Federal help is needed for the development of health and educational services in the poorer areas.

The trend in size and age composition of our labor force has implications for future problems of employment and unemployment. The present virtually full utilization of the labor supply probably would not be maintained if our defense preparations and economic aid to other countries were halted. Furthermore, whereas those now coming of working age are from the relatively small contingent of "depression babies," in another decade the much larger cohorts of persons born during the '40's will be entering the labor market. If the competition for jobs is keen, and if present attitudes of employers toward employment of older workers are continued, workers in the 45 to 64 age class probably will be the first to feel the pinch.

The relentless increase in the number and proportion of aged persons raises a variety of problems that cannot be overlooked. Their increase presents challenges not only of the development of adequate programs for the economic security of this group but also of finding ways and means of enabling the aged to continue functioning as useful

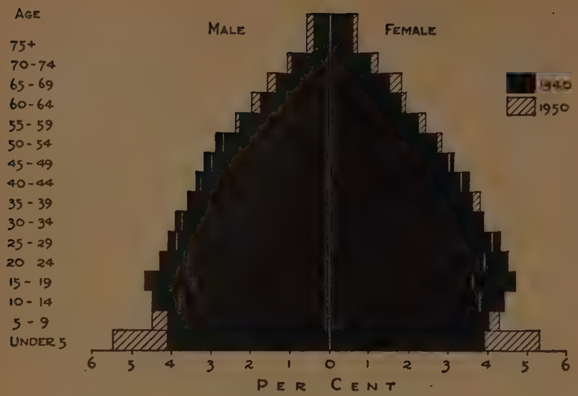

Figure 1. Age Pyramids for the Total Population of the United States, 1940 and 1950

1950 data are preliminary

members of the community. Probably some of the other problems would be reduced if the older persons did not feel that they were being "put on the shelf."

Finally, and with reference to demographic factors in the world setting, we find ourselves confronted with both immediate and more distant problems of security. The immediate problems are those surrounding the emergence of the USSR as a world power. That country is in the rapid growth phase of its demographic history and has demonstrated remarkably fast progress in industrialization. In the face of her potential power and of her aggressive tendencies, there is the obvious need for the closest co-operation possible among the democratic nations of the world.

The more distant but highly important problems are those associated with the potentials for rapid population growth in the underdeveloped areas of the world, and particularly in the already densely settled areas of the Orient. Some may argue that it is to our own best interest not to encourage population growth in the Orient by helping to improve economic and health conditions. The more enlightened opinion, however, is that both health and security are indivisible in a world closely linked by transportation and economic interrelations. Furthermore, it is unsafe to ignore the general awakening that is already taking place among the so-called backward areas of the world. Most students of population and its influence on finance go along with these views, but they also add that the lowering of fertility is a requisite to an permanent elevation in levels of living in the underdeveloped areas, and they urge that programs of modernization should be concerned with methods of speeding declines in fertility as well as mortality. It is to our best interest to help the underdeveloped areas achieve a balanced modernization and through the United Nations and other agencies to help promote the health and security of all peoples.

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In brief, the new definitions result in an "upgrading" of the population from rural nonfarm to urban status and from rural farm to rural nonfarm status. The Census Bureau has estimated that about 8 million people who were classified as urban in the 1950 Census would not be so classified under the old definition. This was due mainly to the inclusion of the "urban fringes" of cities of 50,000 population and over.

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Petrochemicals—A Dynamic Trend

HOWARD J. CARSWELL

IMPRESSIVE IS THE FACT that today about half of the U. S. production of synthetic organic chemicals originates in petroleum and natural gas. During each of the last five-year periods, their poundage output has doubled, and, in the several years since World War II ended, the expansiveness of this ultramodern young industry has been a dynamic phase of the expanding economy.

Obviously petrochemicals have figured importantly in the average growth in sales of 248% during the decade from 1940 to 1950 for the eleven largest chemical companies. Chemistry is going strong in many process industries. Chemical divisions have been established in petroleum in an impressive way, and in rubber, electrical machinery, meat packing, and cereals. Jointly owned companies have been formed to manufacture new textile fibers, petrochemicals, and organic chemical intermediates. In the technology of *use* of materials there is a "chemicalization" that is significant.

MASSIVE MARKETS DEPEND ON PETROCHEMICALS

Consider the massive markets that depend on petrochemicals, and consider also the reasons for the new renown of the Texas-Louisiana Gulf region, in particular, for chemicals manufacturing. As an automotive accompaniment, most of the alcohol and permanent antifreezes come from petroleum sources. The auto industry consumes large amounts of plastics, protective coatings, and chemical end products. The United States must have a great capacity for synthetic rubbers, which largely depend on derivatives of petroleum hydrocarbons, especially butadiene and styrene. Plastics continue their aggressive growth in which the polyethylene and vinyl compounds are an expansive phase. Detergents have a great market potentiality. Some detergent base materials can be produced in the same plant manufacturing high-octane gasoline additives, giving a refiner more flexibility of operation.

PRIMARY DEPENDENCE FOR MAN-MADE FIBERS

If a "revolution" is further indicated in textiles, then petrochemicals are the primary dependence for the man-made fibers. The outlook appears to favor new and maybe better fabrics of natural and man-made fibers used in blends, or combinations. The manufacture of cellulose acetate fiber consumes impressive amounts of petrochemicals, and the new and impending synthetic fibers, as nylon, Dacron, Dynel, and Acrilan are largely children of petrochemistry. Impressive capital is being invested in new manufacturing facilities for the acrylic fibers having certain wool-like qualities.

Usage of agricultural chemicals has multiplied. Agriculture is becoming more mechanized, with the airplane being applied more and more for spreading pesticides and plant food chemicals over fields. A new method is significant for using irrigation water to carry enriching chemicals in solution. Small grains, cotton, sugar cane, and produce figure in the progressive changes in modern agriculture demanding chemicals in the forms of plant foods, soil conditioners, weed killers, pesticides, and so on.

AMMONIA FIGURES IMPORTANTLY

As the common carrier of nitrogen, ammonia figures very importantly in the great petrochemicals development. Ammonia does not contain carbon, but 60% of the country's ammonia output now comes from natural gas as a source material. Ammonia has a great strategic significance, whether for war or peace, because it is so basic to explosives, soil fertilizer, and numerous chemical products.

And looking toward the future, large quantities of petrochemicals will some day be needed as fuels for propelling rockets and guided missiles.

The reason is obvious why seven eighths of this country's petrochemicals capacity has located in the region of the Texas-Louisiana Gulf. Foremost is the abundance of hydrocarbons in the form of petroleum, refinery gases, and natural gas. The region has sulfur, lime, salt, air, and water as other chemical raw materials. It has advantageous climatic and transportation facilities, especially deep water for shipping into coastal and world markets. Before World War II the petrochemical industry in the Gulf Coast area was about a $65 million enterprise but today has grown to a good $500 million, according to *Service* magazine of the Cities Service Company.

Solvay process division of Allied Chemical & Dye Corporation is joining the trend to the Texas Gulf, indicating diversification of activities by formation of an organic chemicals section. A new $5 million plant is planned for a 650-acre site at Orange, Tex., for the manufacture of ethylene glycol and ethylene oxide. Koppers Company, which figures so eminently in the coal tar industry, is expanding vigorously in chemicals, and its new plant at Port Arthur should go into production this year. There is ample room on this site for future additional constructions for making petrochemicals. At Port Arthur the Koppers Company will initially make ethyl benzene, which is important in plastics and synthetic rubber.

Of course, the development occurs elsewhere, too. California and other sections have figured. Two petrochemical plants are underway in Kentucky and Illinois for siphoning heavier hydrocarbons from the flow of pipe line gas for conversion into chemicals. The pioneer plant in chemical use of natural gas in West Virginia deserves tribute.

The technology of petrochemistry — or any phase of chemistry for that matter—is much too complex and proliferative for other than oversimplified discussion by a lay observer. One basic petrochemical can have numerous progeny. Ethyl alcohol, as one example, is basic to about 114 chemical products in the experience of the Carbide & Carbon Chemicals Company, a division of Union Carbide

& Carbon Corporation, which pioneered so outstandingly throughout this historic growth of petrochemicals.

This oversimplified lay discussion is confined to a few elementary areas. Synthetic rubbers are excluded because of space limitation and the fact of their being more familiar. So are carbon black and sulfur extraction processes in which our great oil and chemical companies have done so well.

OIL REFINING MAKING HISTORIC PROGRESS

While chemical research was achieving great results in creating new and better things, oil refining technology was making historic progress. Fractional distillation techniques for separating various hydrocarbons, particularly those of low boiling points, were perfected. Better thermal and catalytic cracking methods developed as the oil industry improved the yields and quality of gasoline and kindred products. Refining ingenuity made possible the revising, rearranging, building up, and breaking down of that astonishing conglomeration of hydrogen-carbon molecules that constitutes crude oil.

MOLECULES EXIST IN DIVERSE SHAPES

These molecules exist in diverse shapes, including the open-chain-type (aliphatic) molecules of hydrogen-carbon and the aromatic ring-shaped structures. Among the larger-tonnage aliphatic chemicals are acetic anhydride, methanol, formaldehyde, ethanol, acetaldehyde, ethylene glycol, isopropanol, acetone, acetic acid, vinyl chloride, and methyl ethyl ketone. These have had remarkable growths, percentage-wise.

The ring-shaped hydrocarbons, of which benzene and toluene are the most simple, are produced in the coking of bituminous coal but do not occur so much from petroleum. This is mentioned because oil-refining technology learned to convert molecular chains into molecular rings, and apparently petrochemistry is trending today into the colorful field of aromatics which the coal tar industry developed and dominated. America's consuming needs appear to exceed by far the capacity of coking ovens to produce certain of the crude aromatics. Although expansion of steel-making capacity has proceeded, and with it coking capacity, the fact remains that benzene and certain aromatic companions may come increasingly from petrochemistry. This is particularly true for benzene. The United States needs something like 220 million gallons of benzene a year, and it has been predicted that by 1955 this may grow to 400 million gallons.

Until now much progress has been made with the Lightest, simpler hydrocarbon molecules which occur in refinery gases, liquefied petroleum gases, and natural gas. This is to say that most petrochemicals thus far start from methane (1 carbon), the chief constituent of natural gas, and ethane (2 carbons), propane (3 carbons), butane (4 carbons), pentane (5 carbons), and so on. Liquid gasoline consists generally of hexane (6 carbons) through decane (10 carbons).

Taken as they are, these are important starting structures for chemical proliferation, but it is also emphasized that these can be converted or cracked into the highly reactive *unsaturated* molecules as acetylene, ethylene, propylene, butylene, and so on. The layman would describe ethylene, for example, as the ethane molecule lacking two hydrogens knocked out in the cracking process.

Ethylene, propylene, butylene, and isobutylene are four refinery gases which have such commercial importance that in 1950 they were produced in an amount valued at $154 million. Acetylene has such real and potential significance that it is a story by itself. These *unsaturated* gases also are derived from their saturated counterparts (ethane, propane, butane) obtained from natural gas, as distinct from the oil refinery gas. This points up the significance of the new petrochemical ventures along natural gas pipe lines in Kentucky and Illinois of Mathieson Chemical and National Petrochemicals Corporation, aside from the impressive natural gas processing for chemical purposes on the Gulf.

HEAVIER HYDROCARBONS HAVE REAL POTENTIALITY

The heavier hydrocarbons, as those in gasoline, have a real potentiality as chemical source materials for processing. An impressive reason is the trend into the heavier ring-shaped hydrocarbons, as benzene and toluene, on which depend a colorful array of dyestuffs, explosives, perfumes, solvents, and such.

In fact, the aromatics of coal for chemistry have been called "psychological" chemicals because of their impression on man's eyes and taste due to the colors, aromas, and flavors which characterize them in dyestuffs, perfumes, food colors, flavors, and the like. (Parenthetically, a layman would consider chemical potentialities in this light. From only 26 letters of the alphabet man has devised hundreds of thousands of words. From a few of the most reactive atoms of the chemical scale he might be able to improvise many thousands of new molecules. In this endeavor the hydrocarbons have a fundamental role in arrangements with oxygen, chlorine, nitrogen, sulfur, fluorine, and so on. In theory, almost any organic chemical can be derived from petroleum. But economic factors rule, of course.)

Most of the advances thus far in petrochemicals have involved oxygen, the oxidation of basic and simpler hydrocarbons, and the dozen or so family groups are classified as alcohols, ethers, esters, acids, aldehydes, ketones, and so on. In the future it is expected that chemical research will strive to develop new and more complicated molecular structures with primary end uses in mind. In other words, special chemicals for special purposes.

Celanese Corporation won wide recognition for its success in its technique of using oxygen from air in reaction with butane and propane for producing a range of chemicals. A major one is acetaldehyde, which is converted into acetic acid for manufacture of acetate rayon and plastics. Other chemical reactions also produce formaldehyde, methyl alcohol, normal propyl alcohol, butyl alcohols, propylene glycol, and solvent mixtures.

In this layman's discussion, let us consider a few simple "building blocks" for the elaborate masonry of synthetic organic chemistry. Among these are acetylene, ethylene, butylene, and ammonia.

Historically acetylene gas has come from calcium carbide, and it grew to commercial greatness for the cutting, welding, and conditioning of metals and as the parent of hundreds of chemicals used in the manufacture of plastics, sulfa drugs, insect sprays, and so on. It is significant to Vinylite plastics and to Dynel, the new synthetic textile having certain wool-like properties. Acetylene looms portentously in the processing of natural gas because of new techniques involving a high-temperature reaction of methane and oxygen. One of its possibilities may be for producing benzene, although the economic feasibility of this is yet to be demonstrated. In the future acrylonitrile will be made also from acetylene.

ETHYLENE GLYCOL

Ethylene has a great importance in making ethylene glycol, a permanent antifreeze. The making of tetraethyl lead requires ethyl chloride and ethylene dibromide for the ethyl fluid. Ethylene oxide is basic to acrylonitrile which is so important for the new synthetic fibers, Dynel, Orlon, and Acrilan. Monsanto Chemical Company recently announced a new soil-conditioning resin, named Krilium, which is chemically based on acrylonitrile and which is stated to be far more effective than compost or peat moss for improving soil structure. Dacron, the new duPont fiber is made from ethylene glycol and terephthalic acid, which are petrochemicals. The oil-resistant rubber, Buna N, is made from butadiene and acrylonitrile.

POLYETHYLENE USES EXPANDING

Polyethylene uses have been expanding rapidly, thanks to progress in the use of high-pressures in synthesis, for the polyethylene plastic is produced at pressures of 25,000 to 35,000 pounds per square inch. Peacetime uses include electrical insulation, sheathing for electric wiring, nonbreakable bottles, and packing.

Chlorine has figured importantly. One of the real triumphs of synthetic chemistry was the development of synthetic glycerin by Shell Chemical Company, which operates a large plant producing glycerin by high-temperature chlorination of propylene. Some chlorinated hydrocarbons have great commercial importance.

Related to chlorine is fluorine, the very highly reactive elemental gas. Scientists learned the trick of handling fluorine in developing the atom bomb. Today a new family of fluorocarbon chemicals is in the research laboratory stage. A few are already commercially significant, as the refrigerant Freon. DuPont's Teflon and the Kel-F of M. W. Kellogg Company are fluorine-containing plastics. Fluorocarbon products should prove useful for very high- or low-temperature applications. However, fluorine processing is costly on the basis of existing knowledge.

In the last few years natural gas has become the principal single source of ammonia. From ammonia it is simple to make nitric acid, which is basic to explosives (except atom bombs). Ammonia has great commercial value as a crude chemical for many uses. Fertilizers represent bulk markets as ammonium sulfate and ammonium nitrate. Nitrogenous products are an outstanding phase of the chemical trend involving natural gas. Mathieson Chemical Corporation has been a leader in this development. Lion Oil Company, Spencer Chemical Company, Commercial Solvents Corporation, Phillips Chemical Company are prominent in this petrochemical area.

Ammonia is one of the world's strategic raw materials. Aside from plant food and explosives, it has a widespread industrial usefulness in plastics, resins, and finishes. A major ammonia derivative is urea, which has many uses. Amines, amides, cyanides, and similar organic and inorganic nitrogen derivations, based on ammonia, have numerous values as detergents, textiles assistants, solvents, and the like. An expanding field for ammonia is synthetic fibers.

A BOLD TECHNOLOGICAL VENTURE

A bold technological venture attracting wide interest is the plant of Carthage Hydrocol on the Texas Gulf. What success it may or may not have as a synthetic liquid fuels venture is outside the scope of this article. Built at great risk and courage, it has a timely, interesting technological significance. We are concerned here with its processing of natural gas to produce, aside from synthetic gasoline, a range of bulk crude chemicals as by-products in the forms of alcohols, ketones, aldehydes, and such.

The plant applies a much improved technique based on th Fischer-Tropsch process of German origin. Natural gas and oxygen are reacted to provide synthesis gas, a mixture of carbon monoxide and hydrogen. By catalytic procedure this synthesis gas is transformed into synthetic liquid fuels plus chemical mixtures.

TWO ADDITIONAL POTENTIALITIES

Two additional potentialities are implicit: (1) The synthesis gas production process is versatile and flexible, and it can be manipulated to produce ammonia and methanol. (2) The so-called Fischer-Tropsch technique has a great long-term importance because it is adaptable to bituminous coal.

If the time should ever come when U. S. petroleum reserves run low, liquid fuels and chemicals can be made from coal by Fischer-Tropsch and hydrogenation processes. America has a fundamental abundance of bituminous coal. Union Carbide & Carbon Corporation, after its brilliant successes in petrochemicals, has acquired coal reserves in West Virginia. The U. S. Bureau of Mines and oil and coal companies have pursued long-range scientific studies involving coal for synthetic liquid fuels and for deriving chemicals directly from coal instead of via high-temperature carbonization (coking). That is a potentiality which is strategic to the future of the American economy.

The roles of petrochemicals and coal tar crudes should be both complementary and directly competitive, depending on the economic factors of supply and price. Other competitive raw material sources for petrochemicals are also the farm crops, as grains and molasses. However, prices of these are prone to fluctuation. Moreover, the dietary value of molasses in livestock feed makes it worth more for that purpose than for fermentation to ethanol, acetone, and so on.

The great names of oil and chemical manufacturing all figure, in one way or another—or in several ways—in the significant growth of petrochemicals. Their achievements are a tribute to their progressive spirit and devotion to scientific research. The few specific mentions were not for purposes of invidious comparisons, for most of the great corporations have had their striking successes. Petrochemicals are an outstanding technological trend of our time.

HOOKER ELECTROCHEMICAL COMPANY

Annual Report

★ FOR THE YEAR ENDED NOVEMBER 30, 1951

Highlights of the 1951 Report

Sales up 42% and earnings before taxes up 49%—new highs for second successive year.

★

After increased taxes, net earnings declined 5% . . . $3.46 per common share on 971,470 shares compared with $3.84 for 1950 on 879,514 shares.

★

$5,700,000 expended for plant expansion at Niagara and Tacoma to provide greater future capacity.

★

Significant new product developments expected to further increase diversified chemical production now 70% of total sales.

★

1951 Annual Report, including 10-year Summary, Available on Request.

Results of Operations

	1951	1950
SALES of chemical products and services	$39,687,600	$27,897,300
PLUS: other income	716,400	513,800
EQUALS: OUR TOTAL INCOME	$40,404,000	$28,411,100
LESS: OUR COSTS OF DOING BUSINESS:		
Wages, salaries, payroll costs	$ 8,786,500	$ 7,638,800
Raw materials, power, fuel, transportation, local and state taxes, other costs	19,109,500	12,202,300
Depreciation on buildings, equipment	1,980,800	1,514,200
	$29,876,800	$21,355,300
LEAVES: PROFIT BEFORE INCOME TAXES	$10,527,200	$ 7,055,800
LESS: FEDERAL INCOME TAXES	6,950,000	3,285,500
LEAVES: NET PROFIT	$ 3,577,200	$ 3,770,300
LESS: CASH DIVIDENDS	2,155,300	2,088,200
LEAVES: RETAINED FOR USE IN BUSINESS	$ 1,421,900	$ 1,682,100
FINANCIAL POSITION AT NOVEMBER 30		
CURRENT ASSETS	$13,100,600	$10,884,600
LESS: CURRENT LIABILITIES	4,697,300	$ 2,531,800
LEAVES: NET WORKING CAPITAL	$ 8,403,300	$ 8,352,800
CURRENT RATIO	2.79 to 1	4.30 to 1
TOTAL ASSETS	$35,106,600	$29,127,300
LESS: TOTAL LIABILITIES	8,297,300	3,731,800
LEAVES: NET WORTH	$26,809,300	$25,395,500

From the Salt of the Earth

HOOKER ELECTROCHEMICAL COMPANY

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Chemicals—A Growth Industry

W. W. DENNIS

THE FACT has been impressively brought home to the investing public during the last several years that the chemical industry is a growth industry and one of the most dynamic on the economic scene. Our era is sometimes called the chemical age, but it might also be called the electronics age or the atomic age. Perhaps we should better refer to it as the scientific age, because all these developments are interdependent. It should not be thought that, because of the chemical developments and the rapid growth of the chemical industry in the last two or three decades, the industry is approaching maturity or nearing the point of losing its momentum. The keynotes sounded by some of our leaders in the chemical industry, such as "Better Things for Better Living through Chemistry," "Molding the Future through Chemistry," or "Serving Industry Which Serves Mankind," to name a few, are not merely apt phrases to be taken lightly.

After all, the industry received its first great impetus during and following World War I, little more than thirty years ago. Before then, its activities had been mainly confined to the inorganic acids and chemical compounds—relatively low-priced and bulk products. Germany, through its intensive research, and its extensive basic patents in this and other countries, dominated in the organic chemical field. Their basic patents in the United States discouraged research by the American industry because of the monopoly prices demanded by the Germans for licenses for product development and production. Moreover, the American chemical industry received little or no protection under our tariff laws from the German competition, partly because of the low rates and partly because of the German patent monopolies. World War I brought this situation forcibly to the attention of the American people and their representatives in Congress by cutting off German imports. The industry was beseeched and besieged to supply the deficit for our vital needs. From this point on, propelled by urgency, freed from destructive competition, and encouraged by legislative action, the industry, which had not been noted for its profitability, emerged rapidly, despite lack of technical know-how, of operating experience, and of capital, into organic chemicals and other fields from which it had been practically barred previously. Even so the technical advances and physical growth during the decade after World War I were highly impressive.

Then the depression of the early 30's hit the chemical industry as it did all the others. Retrenchments were called for, but the industry held on to its trained personnel, partly by consolidations of some companies which were going through more troublous times than others. However, the bottom of that depression had scarcely been reached when programs for expansion of plant and of research were taking form, as a result of the vistas opened up in the preceding decade. Whatever progress was made, that decade was merely the first stage of modern chemical development.

If one is greatly impressed by the progress and growth in the 1920's, he may be properly amazed at the advancements during the last ten or fifteen years, but he may be even more amazed at the vistas that are opening up to chemists and engineers which the developments of recent years foreshadow. There is neither space nor time to do much more than list the fields of progress during the last ten or fifteen years, and, to the sophisticated readers of this journal, the list, by its nature and variety, will suggest merely the threshold of future chemical development.

MAN-MADE FIBERS

Recent developments in this field have been mostly with the synthetic polymers and copolymers as distinct from the cellulose-based rayons. Chief of the former are nylon, the acrylonitrile-based fibers (Orlon, Dynel — copolymerized with the vinyls — and Acrilan), and Dacron, formerly known as Fiber V. The last four are or will be coming into commercial production over the next year or so. The old rayons are, of course, continuing to be developed, and an important new item in that field was the high-tenacity viscose yarn shortly before World War II which has now largely replaced cotton fabric in auto tires. Mention should also be made in the fields of other new fibers such as the glass fibers and Vicara, a protein based fiber although these are not considered synthetic fibers. Producing the intermediates for these new synthetic fibers is now beginning to tax the ingenuity and production facilities of the chemical industry.

DYESTUFFS

The newer developments in rayons and in the new synthetic fibers have resulted in the creation of many new dyes and application methods as well as chemical finishes. Such demands on the dyestuff industry have been tremendous and at times trying, but by now practically every dyestuff requirement has been met, even for the new emerging synthetic fibers. Among other prominent developments in the dyestuff field are the fluorescent dyes and, more recently, the brighteners which make white so much whiter and pastel shades so much clearer, and which are finding increasing application in detergents for washing fabrics.

PETROCHEMICALS

While this field is not new, it received tremendous stimulation for the development of tonnage products from petroleum with the beginning of World War II. Sufficient supplies of toluene simply were not available from coal tar distillation to meet the needs of the Armed Forces. An adequate supply of raw material for styrene and butadiene could be made available only through petroleum chemistry for the great synthetic rubber program. During and after the war, supplies of glycerin were chronically short, owing to the rapid expansion of demand for synthetic resins and the relatively slow growth of soap, which was already beginning to meet competition from synthetic detergents. Glycerin is now being produced synthetically from petroleum. The growing shortage of coal-tar-derived naphthalene is causing the industry to turn to petroleum-derived *o*-xylene to meet expanding demand for phthalic anhydride. New processes for synthetic benzene will soon be in commercial production. These are only a few high lights in the rapid development of synthetic chemicals from petroleum. There are companies in both fields which are pursuing these developments independently, but, in recent years there has been a tendency toward weddings and births of third companies to carry on the work, chiefly because of technical knowledge and organization of the chemical companies in the organic chemical field.

PETROLEUM ADDITIVES

Related to the technical advances in petroleum chemistry but supplied mainly by the chemical industry are the enormous quantities of cracking catalysts, detergents, antioxidants, corrosion inhibitors, additives for high-pressure lubricants, and so on, that are now going to increase the yields (aviation gas) and to improve the properties of petroleum products.

SYNTHETIC RESINS

Although not relatively a new field, the development of new formulas from new or different materials and the quantities produced and consumed in the last decade or so have been tremendous. Chief among these of recent development are the polystyrenes, the copolymers with vinyls (to a large extent with chlorine derivatives), polyacrylates, the melamines, the silicones, the fluorocarbons, the polyester resins, polyethylene, and various copolymers, such as those using acrylonitrile. Although there is considerable overlapping of competitive use between the various synthetic resins, each has special and distinct properties which has greatly extended their scope of application. Their uses in surface coatings, insulation, moldings of various types, textile finishes (for crease and shrink proofing, softening, and so on), impregnation of papers for wet strength, laminations (of paper, textiles, glass fibers, and other materials), ion exchange resins, and others are triumphs of application research in the industry.

RUBBER

The combined efforts of the petroleum, chemical, and rubber industries in bringing the synthetic rubber program to fruition are well known, but some of the major developments since World War II are worthy of comment. One is the successful effort to improve the quality of GR-S rubbers by greatly lowering the polymerization temperature, combined with certain other changes (the so-called "cold rubber" process), and the introduction of high-abrasion furnace blacks as a reinforcing ingredient. Another development has been the discovery of a new and better antioxidant which prevents discoloration of white and light-colored rubber goods.

AGRICULTURAL CHEMICALS

Developments have been characterized by new products and new applications. For example, calcium cyanamide is now finding wide application as a defoliant of cotton, soy beans, and other field and truck crops, which greatly improves the fruiting and facilitates mechanical harvesting. Liquid anhydrous ammonia is now being introduced directly into the soil as a nitrogen side dressing for crops, particularly in the lower Mississippi Valley. In recent years, the agriculturist has been provided with far more effective insecticides such as DDT, benzene hexachloride, Chlordane, Allethrine, and Parathion. Some of these, particularly the last, are toxic to a greater variety of insects than others. Not to be overlooked are the new herbicides such as 2,4-D; 2,4,5-T, and potassium cyanate.

SURFACE-ACTIVE AGENTS

Many new and improved products have been introduced in recent years, and this field has grown tremendously. They include wetting agents, emulsifiers, dispersing agents, and detergents. They have been rapidly replacing soaps for industrial purposes and are now making heavy inroads on household soaps for dishwashing, laundering, and hair shampoos.

FOOD ADDITIVES

Increasingly, particularly within the last decade, chemicals are being added to foods as preservatives, flavoring materials, bleaching materials, surface-active agents, colorants, enrichers, and so on. Such chemical additives are becoming more and more necessary under modern conditions for the preservation of foods, for the improvement of their nutritional values, and to increase the variety and acceptability for the consumer's tastes. Our laws are entirely adequate, and their application has been highly successful for the protection of the public.

PHARMACEUTICALS

It is in this field that there have been perhaps the most rapid and most dramatic developments in modern chemistry. The great achievements in this field were the result of the rapid advances in the knowledge of human diseases (indeed, of the whole complex of human body organisms) made by the medical profession, which advances, of course, received impetus from two world wars. These achievements were also made possible by the chemical and pharmaceutical industry, as a result of the accumulated knowledge and experience with organic chemistry and fermentation processes. The efforts of the industry's scientists, working closely with those in the medical schools, government, and private hospitals, and others in the medical profession, have brought out many products contributing substantially to the health and longevity of humanity. The list is long, and many of these products have become household words. However, the trend in human preventatives and curatives is definitely toward the chemotherapy products which have more positive effects on physical ailments and which are often tailored to specific needs.

Similarly, but somewhat less rapidly, has been the technical progress in treating diseases of animals and poultry. It has been found that some of these diseases respond remarkably to certain of the chemotherapy products, and the use of such products has expanded amazingly in the last few years. As a result, not only have losses among flocks and herds been sharply reduced, but average quality and weight is being substantially increased as well.

The foregoing is an inadequate list of the causes for the rapid growth of the chemical industry in recent years, for it covers up much process and engineering development which in itself has made possible much of the new product and new application expansion. It also covers up expanding demand for older, standard products in both the inorganic and the organic chemical fields. Most of the new developments listed above are end-use products so far as the chemical industry is concerned, and their rapid growth increases the demand for the older and standard chemicals.

Now what of the future? It would take a better chemical mind, or one with more temerity, than I would have to make specific prediction. The industry is constantly striving not only to produce new products, but also to improve its products and their applications and processes. It is certainly safe to say that technical progress of recent years in the fields noted here will lead not only to new developments along the same lines but also to other new products and new applications. A considerable number of companies are heavily engaged, directly or indirectly, in projects relating to atomic energy and by-product developments. Here are new potentialities which I could not discuss if I knew about them. In the field of human and animal treatment and nutrition, the chemical and pharmaceutical industry will find new materials and new applications just to keep up with the broad advances being made in the knowledge of body organisms.

A good measure of future progress and growth in the industry is some of the economic aspects of research. On the average, the chemical industry is devoting between 2½ and 3% of its gross income to research, and the figure for the pharmaceutical industry is near 5%. Naturally, it will vary between companies. In the first nine months of 1951, the research costs for the American Cyanamid Company amounted to 3.9% of sales, which included substantial sums in the pharmaceutical field. A few other companies spent over 3% in 1950, and very few spend less than 2%. Current reports indicate that most chemical companies will spend more in 1952 than in 1951, though perhaps no more in relation to sales. Now, most of the recent developments of the industry were not overnight occurrences but represent the results of research that may extend back 5, 10, 15 or more years. It is usually difficult to draw a dividing line or starting point because of the interrelation and interdependence in research. I venture to say that research is pursued more intensively in the chemical and pharmaceutical industry than in any other major industry with the exception of the electric equipment industry. Knowledge and skill accumulate and grow with continued research. If the experience and faith of the industry in research means anything, it justifies the conclusion that future progress will be unabated, for no one yet knows the limits to chemical research.

This general prospect for scientific advancement in the chemical industry must be premised on the industry's ability to overcome and adjust itself to problems and handicaps that arise mostly outside the industry. A major premise must be a healthy economic climate for private enterprise. This, of course, equally applies to any industry.

Of immediate concern and a problem for the chemical industry is that of scientific personnel. There is a serious shortage, of long term as well as immediate significance to research. War, whether hot or cold, has major effects on normal research and on the supply of technologists for several reasons:

1. The draft takes technical men into the Armed Forces for technical work and even for assignments not using their technical training and experience. Although the treatment of technical personnel, in this respect, is not all that can be desired in the present emergency, there is greater disposition today to permit exemption of such men in industry than in the last war.
2. Technical personnel in industry must be diverted from peacetime projects to research projects for the Armed Services. It is now causing a heavy drain in the industry.
3. In hot war, young men are drafted from our colleges and universities, creating a hiatus in the output of technically trained men as long as the war's duration. In the present emergency, deferment is fairly satisfactory. However, the draft also takes precollege men and, therefore, a future supply of technical trainees.

Thus, future technical progress is being restricted by diversion of personnel and drain on the future supply, while the trend of demand is rapidly on the rise, even more than had been anticipated a few years ago.

Another major problem is that of basic versus applied research. Not many chemical companies can afford the expense and risks of engaging adequately in basic research. Much of this in the past has been done in universities and in other public and private laboratories. In an era when the need for it is rapidly growing, the financial resources of most of our colleges and universities, heretofore major contributors, are relatively shrinking because of our tax laws and artificially low interest rates. The chemical industry is sharply aware of this situation. Chemical companies have been rapidly increasing their contributions through scholarships, and consideration is being given toward other means of aid. Incidentally, war and the present emergency divert personnel from basic to applied research.

Another major problem of the chemical industry is that of finding capital to finance the further growth that is in prospect. For the six years, 1946 to 1951 inclusive, the Department of Commerce and SEC estimate that the total capital expenditures by the chemical and allied products industry totaled $5.4 billion. This is compared with their estimate of gross capital assets of the industry at the end of 1945 of $4.2 billion. The Department of Commerce and SEC estimate that companies in the chemical and allied products industry spent $1,266 million in 1951 for new plant and equipment, compared with $771 mililon in 1950. According to an as yet unpublished private survey, preliminary indications are that chemical companies expect to spend appreciably more during the year 1952 than they did in 1951. But, whatever expenditures may be next year, future capital requirements are likely to be far higher than in the past, partly because of the higher costs and partly because of anticipated progress in the industry. Managements may properly be concerned about where the money is coming from to maintain the industry's growth. Traditionally, much of the capital for expansion has come from retained earnings. Under the present excess profits tax law, a corporation can be taxed up to 82% with an over-all ceiling rate of 70% of its net profits. The industry should bear its share of the tax burden, but this tax is grossly inequitable to growth companies, such as those in the chemical industry. As one chemical executive recently put it, "How long can the game go on when the house takes 70% of the winnings?" Another source of funds has been depreciation reserves, but annual depreciation reserves on older equipment, which cost only one third to one half as much as new equipment, falls far short of replacement needs from that source. The deficit must be made up from expansion money. Accelerated depreciation reserves under certificates of necessity will be of some help, but the total amount applied for and granted under certificates is only about $700 million to date for industrial chemicals and about $100 million for pharmaceuticals. This represents much less than the capital expenditures of the industry for one year, and an average of only about 50% of these amounts are subject to the higher rate of amortization. All of this points to the vital need for revision of the tax laws for more equitable treatment of corporate taxes in the next bill to come before Congress. Unless such relief is given, the chemical industry will have to resort more to outside sources of capital than they have been accustomed to. Fortunately, securities of the chemical industry have a relatively high rating in the markets, but is it not probable that this higher rating is due partly to conservative financing?

Who knows? Perhaps 1952 will be a year for change and for renewal of faith and optimism for private enterprise in this country.

* * *

One of the most dismal chapters in American banking history is that which records the creation and collapse of banks owned and managed by the States.

Charles A. Conant

The rate of interest determines the value and price of all those saleable articles which are desired and bought, not for themselves, but for the income which they are capable of yielding. . . . The price of land, mines, and all other fixed sources of income depends in like manner on the rate of interest.

John Stuart Mill

The most obvious way in which the influence of a tax on prices manifests itself is through the process of shifting. . . . The payment of a tax may so modify the position of the taxpayer as to influence his future actions . . . so far as taxation brings about a new equilibrium of economic forces, even a general income tax may ultimately and indirectly affect prices.

E. R. A. Seligman

No material, then, enjoys security in its strategic position. All are played upon not only by all the facts of culture which the economist reduces to the shorthand of "demand" but also by all the facts of technology, industrial order, political control which forever redefines the function of a good.

W. Hamilton

. . . Big Plants and Small Towns

THERE'S a good business combination! The advantages which both industry and labor enjoy in smaller communities, away from crowded metropolitan centers, are evident throughout the territory served by West Penn Electric.

There are no *big* cities in West Penn Electric's service area. Yet, located within this territory of 29,000 square miles . . . in Pennsylvania, West Virginia, Maryland, Ohio and Virginia . . . are many large plants of blue-chip companies which use our service. Among them, to name half-a-dozen in different fields: United States Steel, Alcoa, Westinghouse, Celanese, Union Carbide, and Pittsburgh Plate Glass.

In addition to big business, this area is rich in small and medium-size firms—making thousands of different items in scores of different fields. Regardless of their size or business, these manufacturers depend on the West Penn Electric system for the power to turn out their widely diversified products.

Information regarding West Penn Electric's operations may be obtained at the Company's office, 50 Broad Street, New York 4, N. Y.

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(INCORPORATED)

Business Machines: Revolution or Evolution

EDWIN S. McCOLLISTER

It is a mark of our times that a publication devoted largely to the interests of security analysts should call special attention to activities in science. Today, the strength and prospects of an enterprise must be evaluated not only in terms of management, sales force, and manufacturing efficiency; equal consideration must be given to its engineering program. And, in a growing number of instances, the depth and breadth of the research program in pure science must be examined.

The distance in time between the work of the pure scientist and of the engineer is steadily shortening. Only a few years ago a group of physicists split the atom. Now we are talking about atomic power plants. The mycologists and biologists who discovered and made known the medical properties of the antibiotics created a need for new investment in plant facilities, to say nothing of the effect at all levels of distribution. The development of nylon had ramifications all along the line in the textile industry. One hardly need mention what is happening to radio because of television. And around the business machines industry there swirls talk of a second industrial revolution to emancipate the white collar class.

We think of ours as a society that has prospered with the help of great quantities of laborsaving machinery of innumerable kinds. Yet, almost every example that we call to mind is machinery to save physical labor. The automobile spares us the effort of walking. The combine in the wheat field does the work of a hundred men with the scythe. The bulldozer can outdo fifty shovels. It is in the area of repetitive *mental* labor that the new revolution is said to impend.

In talking about the future every man becomes a seer and an expert, and who is to challenge him? If the first industrial revolution arrived unheralded, the second is approaching to the sound of a thousand trumpets blown by those with their eyes firmly fixed on the bright blue sky. It is a triumph of communication over common sense. But underlying the confusion is a growing base of solid accomplishment which reveals scientific *evolution* at quickened tempo.

MACHINES THAT CALCULATE AND PROCESS

The machines that figure largest as mental laborsaving devices are those that can calculate and can process information. As business and government grow in size and diversity of interest, the paper work burden mounts in geometric proportion. Science, which is partially responsible for these new proportions, has fallen heir to growing pains of its own. Mathematical models must replace physical models in many stages of experiment with nuclear fission or supersonic aircraft, to cite only two examples. The mathematics is not necessarily difficult in form; it is in the magnitude and time required for solution by human minds and hands that the problem arises, the same basic problem that besets the large corporation with payrolls to prepare, bills to pay, and sales to analyze and account for.

The situation is analogous to that which existed on an infinitely smaller scale in the closing decades of the nineteenth century. At that time it was felt most acutely at the U. S. Census Bureau. A rapidly expanding population and a need for information combined to present a census problem of what seemed insuperable difficulty. Future historians will date the genesis of the "second revolution" by the invention of the solution to the census problem—the punched card!

For thousands of years mankind had been developing the art of writing. With the introduction of the printing press it became possible to reproduce large quantities of information. But all of this information was dead and inanimate until acted upon by a human being. The book on the shelf could do nothing by itself. At the Census Bureau, for the first time, there was achieved the seeming miracle of breathing life into numbers. In principle, like the paper clip, it was simple. The effects were legion.

THE PUNCHED CARD

The idea of recording information by punching holes in a card designed for machine handling has been called "one of the fundamental inventions of all time in the art of computation." It brought all of the awakening powers of electricity to bear on the calculation and information handling problem. It was the punched card and the electric machinery developed in connection with it that made possible the first giant scientific digital calculator. It is the device for actuating automatic calculating and information-processing machines that is a potent factor in coping with today's business requirements.

The development of punched card machines used as saving of repetitive mental labor has kept step with developments in the field of electricity. New kinds of relays, counters, and storage devices, linked together with ingenious circuitry, have resulted in calculating and information-processing machines that set new standards for performance and scope of use. And, as that new branch of electricity called "electronics" has become a science in itself, the range of electric-electronic components available to computer engineers has increased correspondingly.

As a result, all-electronic computers have been on the commercial market since 1946. Nearly a thousand of one 1,400-tube model are in use, and sibling business machines of the same family have made good use of tubes in large quantity for well over a decade. Other manufacturers either are about to get into production or are carrying on developmental work.

It was the production of these electronic machines for business that brought them within the practical reach of scientists with great calculations to perform. This is no phenomenon. The familiar desk-type calculator had its origins in the work of the scientists, Pascal and Leibnitz. Yet, it was only their development and production for the needs of business, more than two hundred years later, which made them generally available as a practical and useful scientific tool.

Along with the less spectacular business machines, there have come, starting with the IBM automatic sequence controlled calculator at Harvard University, a number of large, special-purpose calculators designed for scientific use. Costing in the vicinity of a million dollars and built one at a time in engineering laboratories, the recent models are characterized by very high speed of computation, extensive internal storage systems, and facilities for performing a long sequence of operations without the intervention of a human operator. None has as yet been applied to business problems, and there is a real engineering challenge in making them economically and functionally practical for the needs of business. Nevertheless, out of this activity will come new techniques and components adapted to business requirements. The organizations that have kept up-to-date in office systems and business machine methods will find the transition a relatively painless one.

Despite some popular impression to the contrary, these machines do not and never will "think." It therefore becomes necessary for people to work. This includes examination of basic information at the source to see that it is in clean, apple-pie order; that the information follows a consistent and logical notation; that procedures leading to the end results are outlined in detail; and that the end results are as generally satisfactory as it is possible to make them. Moreover, wherever there are exceptions to the normal procedure, these exceptions must be charted in detail so that the machine(s) will know what to do with them when they come along.

SEVERAL REVOLUTIONS STIRRING

The "revolution" in computing and information-processing machines is only one of several that are stirring in the office. On a smaller scale, the electric typewriter is disturbing the old order of things. For thirteen years the electric typewriter was pooh-poohed by most manufacturers. Its advantages were obvious, and, depite widespread opposition, beachheads were established in precincts that had been regarded as the sacred and exclusive property of manual machines. Virtue ceased to be its own reward, and, in the early post- World War II period, almost every major producer came out with an electric machine, while maintaining the manual line. This has given rise to a large number of split sales personalities. The battleground has shifted, and, with more proponents, the market has enlarged considerably. The situation right now is similar to a game of "Upset the Fruit Basket," and it is hard to tell just who is going to sit where. In any case, consistent with the benefits of a competitive economy, the user — and there are many thousands of him—is getting a better selection of good machines than he has ever had before. Manufacturers agree that electric typewriters turn out better work at substantially lower cost in production use, and the higher cost of the electric machine is swallowed up by the improved operating position of a "typing station."

Nor have the manufacturers of dictating machine equipment been immune from the ravages of the electric-electronic era. Acoustic recording on cylinders had a firm grip on the market before the war. In quick succession came electronic recording on disks and belts, and matters were further complicated by first wire and then tape recorders put out by companies new to the office equipment industry. At this time no one not actively marketing such a product can project a balance sheet any distance into the future, and perhaps not even those most directly affected are entirely sure of what will happen next.

To the uninformed observer, comparative calm seems to hang over the mechanical, key-driven bookkeeping machine front. In the proper application these machines are of real value to many segments of business, and in the past few years they have been made new marvels of mechanical ingenuity, taking over many of the duties that formerly had to be performed by the operator.

Not even the prosaic time clock in office and factory has escaped the attention of the engineers. Where it was desired to regulate secondary clocks throughout a building or plant from a remotely located master control unit, it was formerly necessary to install a separate system of clock wiring from the master to all the secondaries. Now, through the use of electronic tubes, it is possible to transmit clock control frequencies over the regular a-c wiring for lighting and power. This saves the cost of special wiring and makes it possible to install a controlled secondary time recorder or indicating clock at any electric outlet.

Typical of the efforts of business to whittle down its problems are improved techniques for handling paper. A variety of duplicating machines and processes can turn out more paper better and faster than ever before. As a countermeasure, microfilming is being seized on to reduce physical dimensions. In the area of bank check handling, proof machines enable a single operator to make multiple distributions, accumulate totals, prove deposit tickets, and stamp the endorsements at speeds as high as 800 to 900 items an hour. A design to handle punched card money orders goes so far as to punch the amount into the card at the same time.

Finally, but certainly not least, is the manual method itself. The manufacture and sale of marginally punched cards, a simple sort of hybrid, has become a multimillion dollar business, and in the present state of things should flourish for a long while. The proper design of paper forms can on occasion produce more savings than a battery of machines, and there are forms-manufacturing companies who can tell you how to do it. Nor has there been any noticeable decline in the sale of lead pencils. Among other things they are being used to mark information on punched cards. The graphite in pencil lead is a good conductor of electricity, and, when such circuits are electronically amplified . . . well . . . they set into operation a whole chain of electric-electronic business machine events. Which brings us full circle.

If performance in the past is any criterion, the business machines industry will be called on to keep pace with the challenge, the demands, and the opportunities of an expanding economy. It will do the work of vast groups of men.

A Statement by Anaconda on the Copper Situation

Many users of copper have vital decisions to make . . . usually in connection with the present defense-induced shortages of copper and aluminum. This statement is an effort to remove the smoke screen surrounding the copper picture . . . to wipe away the confusion caused by too much talk supported by too few facts.

Substitution poses problems — Industry has been urged to substitute aluminum and other materials for copper. In some instances this may be logical and practicable. In many others it is difficult, if not impossible. But — before making *any* long-term decisions that may cost a great deal of money in engineering, new plant facilities or rescheduling of production operations — one should know the facts about the future of copper.

New Anaconda projects — The first major increase in copper production will come from Anaconda when the Greater Butte Project and the new Sulphide Plant at Chuquicamata, Chile, begin operations this spring. By 1953, these two projects should raise present levels of copper production by about 95,000 tons yearly.

Toward the close of 1953, Anaconda's new Yerington project in Nevada is expected to start producing at an annual rate of 30,000 tons. By then, Anaconda will be adding to the present yearly copper supply at the rate of about 125,000 tons.

Other new projects — During 1954-55 still other new projects in the U. S. and friendly foreign countries will further augment the increasing copper supply. All told, it is estimated that by 1955, not less than 450,000 tons of copper could be produced annually — over and above present production levels.

Accordingly, in 1955-56, domestic production plus imports could bring the U. S. copper supply to 1,800,000 tons yearly. This would represent an increase of about 20% over present levels. Based on historical comparisons, and barring a large-scale shooting war, this amount of copper could support a Federal Reserve Board Index of Industrial Production of 270, an increase of 24% over the present, and 45% above the first half of 1950.

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These are the 'things to come' in copper. On the basis of the facts there is no necessity for considering long-range substitution of other materials for the red metal.

ANACONDA
COPPER MINING COMPANY

The American Brass Company
Anaconda Wire & Cable Company
International Smelting and Refining Company
Andes Copper Mining Company
Chile Copper Company
Greene Cananea Copper Company

PRODUCERS OF: Copper, Zinc, Lead, Silver, Gold, Cadmium, Vanadium, Superphosphate, Manganese Ore, Ferromanganese.

MANUFACTURERS OF: Electrical Wires and Cables, Copper, Brass, Bronze and other Copper Alloys in such forms as Sheet, Plate, Tube, Pipe, Rod, Wire, Forgings, Stampings, Extrusions, Flexible Metal Hose and Tubing.

1951 Automotive Production Declines 15 Per Cent

WILLIAM B. HANKLA, JR.

GOVERNMENT-IMPOSED RESTRICTIONS on materials made deep inroads into automotive operations during 1951, resulting in a 20% decline in passenger-car production. Combined production of cars, trucks, and buses totaled an estimated 6,765,000 units, or 15% less than the 8,003,045 produced in the record year of 1950.

PASSENGER-CAR PRODUCTION REDUCED

Passenger-car production, relatively high during the first six months of 1951, was reduced sharply in the last half of the year. Thus total output of motorcars reached an estimated 5,340,000 units, compared with 6,665,863 built in 1950.

TRUCK PRODUCTION TOPPED PREVIOUS YEAR

Truck production, estimated at 1,425,000 units, which included a substantial number of military vehicles, topped the previous year's output of trucks by nearly 90,000 units.

Wholesale value of motor vehicles totaled $9,553 million, in 1951, a decline from the record $10,380,752,000 in 1950.

The industry moved forward during the year on its defense assignments, which now include more than $6 billion worth of contracts for tanks, guns, jet aircraft engines, rockets, shells, military vehicles, and many other types of weapons.

However, in contrast to the events following Pearl Harbor when the automotive industry converted completely to war production, this time the industry has a dual assignment:

1. To prepare plants and facilities for volume production of military equipment.

2. To continue to build the cars, trucks, and buses needed for civilian transportation.

The principles of current defense planning can best be summarized in the words of Defense Mobilization Director Charles E. Wilson.

In his first report to the President on April 1, 1951, Mr. Wilson outlined mobilization objectives as follows:

A. We must produce military equipment and supplies for:

1. Our forces fighting in Korea.
2. Our expanding armed services in the United States and Europe.
3. The growing forces of other nations resisting Communism.
4. Reserve stocks, intended to provide the key items needed for a year of full-scale war.

B. While doing this, we must build toward the productive power that would be needed quickly in case of all-out war.

"With the fullest degree of drive and unity," Wilson said, "We can do this job by 1953. By that date our readiness to enter upon total mobilization should be sufficient; and production, in addition to meeting current military needs, should support a civilian economy at or above pre-Korean levels."

BACKED BY WORLD WAR II EXPERIENCE

Backed by its World War II experience as a major producer of military equipment, the automotive industry has moved into its share of the task with speed and vigor. Construction and conversion of plants, production planning, tooling, and other preparations are under way by motor vehicle manufacturers, as well as automotive parts and equipment makers, in all parts of the country. Thousands of small businesses are taking part in the work as subcontractors and suppliers. Most defense work still is in the tooling-up or make-ready stage, as it will be for several months to come.

METALS IN SHORTEST SUPPLY

Steel, copper, and aluminum are the metals in shortest supply, and it does not appear likely that the situation will improve during the coming year. In fact, as defense production increases in the months ahead, available materials for civilian output may become even scarcer. Although the automotive industry is giving top priority to all military assignments, it recognizes that its normal job of providing transport tools must not be neglected.

Despite record-breaking production in recent years, the Nation is not so well equipped with motor vehicles as it was in 1941. Population has increased vastly. The number of married couples and households has increased at an even greater rate than population. The 1950 Census statistics show that people have moved farther and farther away from their places of work. Scores of surveys, conducted in the past fifteen years, all point conclusively to the fact that, whether measured in terms of people or cars, mileage or trips, more than half of all use of passenger automobiles is for the purpose of getting work done, earning a living, or sustaining the household, and the most recent surveys prove that such necessity use is increasing steadily.

Contrary to the general supposition, fewer cars were produced in the decade, 1940 to 1950, than in either of the two preceding decades. From 1921 through 1930, factory sales totaled 32,196,103 passenger cars. In the next decade, the total was 26,282,839, and, in the next, 25,481,138.

As was discovered in World War II, productivity of weapons is particularly dependent on worker mobility via passenger car. A survey of 749 war plants showed that 75% of the employees drove or rode to their jobs in automobiles. In plants located in smaller cities or the suburbs, such dependence was even greater. Motorists traveled 485 billion miles in 1951, consuming a total of 37,500 million gallons of gasoline.

CURRENT POLICY OF MILITARY AGENCIES

The current procurement policy of military agencies calls for the decentralization and dispersal of industrial facilities. This throws an additional burden on the passenger car. More population shifts will ensue. Greater mobility of workers will be required. For, as World War II experience proved, as factories expand their working forces, they draw workers from an ever-widening radius. Some workers then drove daily from homes 50 to 75 miles away; many still continue the practice.

CARS SUBJECTED TO GREATER USE

Although the Nation now has more cars in use than ever before, they are subjected to greater use than ever before. Moreover, they are older. In 1941, less than one fourth of our supply was more than seven years old; today, more than one half of the supply is in that age bracket.

It is, fortunately, no longer necessary to prove that trucks and buses are essential to the Nation. They demonstrate their worth, day and night, in so many ways that only the most obdurate insensibility to the obvious would still demand proof. As a writer recently put it: "Everything we eat, wear, or use is carried at least part of the way by motor truck." Or, as the proud boast of the truckers summarizes the case for these burden bearers of the highway: "Whatever it is, wherever it came from, a truck brought it."

No discussion of highway transport is thorough unless it incorporates consideration of the highway itself, for the roads and streets of the Nation now carry more than 95% of all passenger-miles of travel in the United States, plus 75% of the Nation's total freight tonnage.

The greater part of this traffic is of a type that must continue in a defense emergency, and even in the event of all-out war. In fact, as was proved a decade ago, many highways must carry increased loads to serve the Nation's defense needs.

The highway plant that must bear this load is seriously deficient. The great road-building era ended in 1930. In the next two decades, a depression, a war, and inflation successively interfered with highway officials' efforts to keep pace with traffic growth, or even to match the volume of road work carried out in the 1920's.

Since 1930, traffic volume has more than doubled, creating steadily greater congestion and more accident hazards on routes designed for lower volume of traffic. This condition was aggravated by the fact that, during World War II, the Nation's highway system was considered expendable by war mobilization officials. Normal rebuilding of worn-out surfaces and bridges was therefore halted, and even maintenance work was neglected.

Hence, by the end of the war, much of our road system, including many of the oldest and most heavily traveled routes, needed complete replacement. Postwar inflation, however, made construction costs soar so prohibitively that the work slowed down. In consequence, our highways continued to wear out faster than they have been rebuilt, according to studies by the U. S. Bureau of Public Roads.

It is therefore essential to national security that, in the present defense emergency and short of all-out war, rebuilding and improvement of major highways and urban traffic arteries be continued at the highest possible level of activity. For the good of the Nation, priority should be given by highway officials to those routes on which are concentrated a high degree of essential traffic movement, such as the flow of workers and freight to and from defense plants, transport of farm products to market, and all mobility serving military establishments.

ECONOMIC ASPECTS OF TRANSPORTATION

There needs to be consideration, too, of the less obvious, but equally important, economic aspects of highway transportation—of the 9 million jobs involved, of the fact that 20% of all the Nation's retail trade is now automotive, of the 46,000 car and truck dealers in the Nation, of the thousands of businesses, large and small, in every state of the Union whose continued existence is entirely dependent on the manner in which this industry does its work.

Under normal peacetime conditions, more than half of every dollar the automotive industry receives from sales goes out to thousands of other businesses throughout the land for the purchase of materials, parts, and manufacturing equipment.

Most of the remaining portion of the sales dollar is spent for wages, taxes, and other operating costs.

During World War II, automotive companies serving as prime contractors in the war production program even extended their normal buying activities. Generally speaking, military equipment is more complex and difficult to mass-produce than civilian products. For that reason the proportion of purchased parts that goes into such things as tanks, artillery, and military planes is even higher than that prevailing in the automotive industry's regular line of products.

Consequently, the system of subcontracting developed during the war was a vital factor in winning the battle of production.

However, it was but an extension of the routine purchasing techniques which long had been practiced by automotive companies with pronounced success. Just before the war, for example, a particular automotive company employed about 12,000 outside sources of supply. The number was increased during the war period to more than 19,000.

Complex, mass-production jobs, for either civilian or military needs, cannot be accomplished single-handedly by one company, no matter how large and well integrated. They require the teamwork of many large and small producers.

In defense work, however, final responsibility for the end product goes to the prime contractor. It is that company's task to organize, plan, and co-ordinate the efforts of many contributors. Such a responsibility requires extensive facilities along with great resources of trained man power, technical know-how, and experience.

Out of the 242,000 manufacturers in the United States during World War II, only 15% had prime contracts with the Government. The remaining 85% contributed in the capacity of subcontractors.

In the present "guns and butter" economy, prime contractors in the automotive industry, with billions of dollars in defense orders on their books, again are spreading production work throughout the Nation.

An example is the company assigned to tool up a huge Government plant and produce the aircraft engines that power B-36 Superfortresses.

Purchasing agents and buyers for the company already have contracted with 1,370 other firms to help with the job. Of these, nearly 70% could be classified as small businesses. One automotive company recently was given the job of preparing plant facilities in New Orleans for production of a 12-cylinder tank engine.

There are more than 7,300 parts in this engine. The prime contractor plans to machine all major parts in the New Orleans plant. Engine accessories, standard parts, and all castings and forgings, however, will be purchased from about 350 different companies, most of them in the South.

In equipping the plant itself, approximately 1,350 machines, 4,800 fixtures, 8,500 tools, and 7,500 precision gages will be needed. Also required are a large number of heat-treating furnaces, washers, paint booths, and miles of conveyors and service piping. All this will be supplied by more than 500 companies specializing in such items.

A-M

DIVIDEND NOTICE

AMERICAN-MARIETTA COMPANY

The Board of Directors has declared the following quarterly dividends:

33rd Consecutive Common Dividend

A dividend of 50c per share on the Common Stock, payable February 1, 1952 to Stockholders of record January 18, 1952.

33rd Consecutive Preferred Dividend

A dividend of $1.25 per share on the Preferred Stock, payable February 1, 1952 to Stockholders of record January 18, 1952.

H. J. HEMINGWAY
President

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This new steel keeps 4000 horses at work!

When you open the throttles on a Navy PT boat, its three propeller shafts have to withstand the twist of more than 4000 horsepower—*and* resist the severe corrosive conditions of salt water.

Armco Steel Corporation has developed a new kind of stainless steel that does *both* jobs! Never before has stainless combined so much strength, hardness and elasticity with good corrosion-resistance.

Defense work is taking most of this new stainless steel now. But looking ahead, it will be ideal for high-quality products ranging from strong, flexible fishing rods to long-lasting handsaws; from table-knife blades to surgical instruments.

Manufacturers who know the extra value of steels *tailored to their needs* are including Armco Special-Purpose Steels in their plans for future products.

ARMCO STEEL CORPORATION

Middletown, Ohio, with Plants and Sales Offices from Coast to Coast
The Armco International Corporation, World-Wide

ARMCO

A Record of Achievement

THE GLIDDEN COMPANY

Highlights of Annual Report, 1951

SALES—During fiscal year ending October 31, 1951, net sales reached record level of $228,522,503, up 21.2% over last year's $188,607,966. Unit volume also was highest on record. Inventories at end of year were $759,080 below year previous.

PROFIT—Before taxes, total was $16,000,868, second highest in company's history. After provision of $7,687,000 for taxes (31% over last year), net was $8,313,868 compared to $8,561,660 in 1950. Per share: $3.65 on 2,280,238 shares outstanding Oct. 31, 1951.

FINANCIAL POSITION—Working capital at October 31, 1951 totaled $46,416,236, up $7,996,199 over year ago. Net worth increased $3,544,492 to $69,738,651. Successful negotiation of long-term loan of $10,000,000 at 3% made possible retirement of short-term borrowing and placed Company in fine position to meet demands for increased working capital.

Another major achievement was redemption of 4½% convertible preferred stock. Of 199,540 shares outstanding October 31, 1950, only 276 were redeemed for cash. 199,264 shares converted by issuance of 296,745 common shares.

EXCESS PROFITS TAX—1952 base is approximately $19,000,000, which, at current tax rates, will allow earnings of approximately $4.00 per share before excess profits rates apply.

PLANT—Net plant additions during year amounted to $4,499,196 and maintenance expenditures were $2,782,457. Since beginning of 1946 net plant additions have totaled $21,456,383. Completed last summer was a new soya extraction unit in Buena Park, California, which will serve the West Coast's rapidly expanding poultry industry. Production rate exceeds rated capacity because of incorporation of efficiencies previously used in Chicago and Indianapolis plants. No large expenditure for plant is contemplated in 1952.

DEVELOPMENT—Agreement made with Defense Materials Administration for exploratory drilling in the Company's zinc properties in California, with an accompanying plan for opening up these mines. Half of drilling costs will be borne by the government. With price of zinc concentrate at about $135 per ton, prospects for these properties are very bright.

CONDENSED CONSOLIDATED BALANCE SHEET

Assets

Current Assets	$62,552,763.34
Other Assets	2,428,433.99
Property, Plant and Equipment	30,893,981.71
Total Assets	$95,875,179.04

Liabilities

Current Liabilities	$16,136,527.63
Long-Term Debt	10,000,000.00
Capital Stock and Surplus	32,603,967.41
Earned Surplus	37,134,684.00
Total Liabilities	$95,875,179.04

CONDENSED CONSOLIDATED INCOME STATEMENT

Net Sales	$228,522,503.18
Profit before taxes on income	16,000,868.36
Taxes — Estimated	7,687,000.00
Consolidated net income	8,313,868.36

QUALITY Glidden PRODUCTS

A copy of the Company's Annual Report will be sent on request

THE GLIDDEN COMPANY • CLEVELAND 14, OHIO

Construction Today

CLYDE SHUTE

THE YEAR 1951 has seen a volume of construction awards considerably in excess of the advance estimates made twelve months ago by Government and non-Government economists. It has been a year of mixed trends, with a total dollar volume at the highest ever recorded, but with a physical volume less than 1942, peak construction year of World War II, and below 1950, the peak year of the postwar period.

CONTROLS PRODUCED CUTBACKS

Various Government controls produced cutbacks in residential, commercial, and recreational building. Although not forbidden, community improvement projects of states and local governments were discouraged. The one notable exception was awards for educational buildings which at the end of eleven months were only slightly below the record level of 1950. These negative influences were partially offset by two important factors: (1) Government stimulation of power and manufacturing plant expansion, and (2) construction of military facilities.

LESS SEVERE THAN ANTICIPATED

A prime reason why the squeeze on construction volume, as well as on many consumer goods, was less severe than anticipated at the beginning of the year was that the defense production program ran somewhat behind the estimated schedules. This means that the stage of quantity production of military end products was not reached. That stage will probably be reached in the first half of 1952.

Consequently, the squeeze on construction, which became apparent in the fourth quarter of 1951, will continue through most, if not all, of the first half of 1952.

Prospects for an upturn in civilian construction sometime around midyear 1952 are good. By that time the output of steel and aluminum will have been appreciably increased. Further, the peak of the current plant expansion and military construction programs will be reached at some stage, and such projects will taper off. In the meantime, civilian construction projects which have been denied allocations of critical metals will accumulate as deferred demands. Copper and copper products are expected to continue in tight supply, even after steel and aluminum become plentiful; therefore the ingenuity of architects and builders will be taxed to find substitutes, wherever possible, for copper and brass mill products.

CHANGE IN CONTROLLED MATERIALS PLAN

As this was being written, National Production Authority officials were reported to be giving consideration to an important change in the operation of the Controlled Materials Plan as it affects the construction industry. Under the plan which is understood to be under contemplation, allocations of materials to construction would be on an entire project basis, rather than on an individual quarterly basis.

ASSURE COMPLETION OF PROJECTS

This change, if adopted, would enable builders to be assured that any project granted permission to start could be completed, and, therefore, the material requirements could be scheduled realistically, which would promote greater efficiency in construction and a probable reduction in cost. This procedure would remove one of the present deterrents to advance planning by potential investors. The change might not directly affect construction volume in 1952, but it would improve the functioning of the industry by re-

Table 1. Estimated Physical Volume of Building

37 Eastern States
Floor Area, Millions of Square Feet

Building Classification	1951* Estimate	1952 Estimate	% Change
Commercial	71	45	-37
Manufacturing	150	145	- 3
Educational & science	104	95	- 9
Hospitals & institutional	30	25	-17
Public	9	7	-22
Religious	24	20	-17
Social & recreational	11	9	-18
Miscellaneous nonresidential	46	45	- 2
Total nonresidential	445	391	-12
Residential	675	540	-20
Total building	1,120	931	-17

*Nine months actual, last three months estimated.

Table 2. Estimated Dollar Volume of Total Construction

37 Eastern States
Valuation, Millions of Dollars

Classification	1951* Estimate	1952 Estimate	% Change
Nonresidential	6,478	6,067	- 6
Residential	6,109	5,136	-16
Total building	12,587	11,203	-11
Public works & utilities	2,656	2,552	- 4
Total construction	15,243	13,755	-10

*Nine months actual, last three months estimated.

moving one of the numerous existing elements of confusion.

The F. W. Dodge Corporation, in making its estimate for 1952 construction volume, has made two basic assumptions: namely, no outbreak of World War III, and no prolonged work stoppages in any of our major industries.

Then, looking toward 1952, we have the knowledge that our population is increasing currently at the rate of 2½ million persons per year, with the most highly developed technology in history, with high level production and consumption, and with a fixed determination for continuous improvement of personal and community living standards. In such an economy there is no lack of potential demand for every kind of building and engineering structure. Also, our experience in 1951 has demonstrated that many pressing demands for civilian construction had to be deferred because we could not have them and at the same time carry on with our defense mobilization.

PROJECTS DEFERRED, NOT ABANDONED

Construction projects which were refused allotment of critical metals by the National Production Authority in the fourth quarter of 1951 were deferred, not abandoned. Consequently, these projects represent a certain portion of construction demand that will carry over into 1952.

There will be continuing pressure for more housing, schools, hospitals, churches, and other community facilities. Although residential building has about kept pace with current demand, the present rate of population growth will generate, for some time to come, a continuing demand for new housing facilities at something near the 1951 rate of production.

The marked rise in school-age population creates a demand for new school facilities that is one of the most pressing needs of the economy.

The growth of towns and cities stimulates demand for various community facilities, and most large cities have a shortage of office building space. Further, the tremendous postwar increase in motor vehicles has accentuated an urgent need for highway extension and improvement.

In addition, we have a number of other important factors which would normally tend to support a large construction volume in 1952; namely:

1. The prospect for full employment is excellent.
2. It is most likely that industrial production and the over-all output of goods and services—GNP—will be at a record rate.
3. It is probable that the aggregate of disposable personal incomes, even after increased tax payments, will exceed the comparable figure for 1951.

Looking now at the influences that may tend to restrict the volume of building in 1952, we must take into account that we will have credit restrictions really in effective operation for the entire year. Although regulation X, credit control of real estate, has been relaxed, it is likely that it will hold down the volume of residential construction more effectively in 1952 than in 1951, because upward of 400,000 of the 1951 estimated total of 1,085,000 dwelling units started proceeded under preregulation X commitments. In other words, regulation X, in its relaxed form, will tend to reduce the 1952 total volume below 1951.

Another factor to be taken into account is the Controlled Materials Plan which became directly operative for the construction industry during the fourth quarter of 1951. Owing to existing shortages in the three critical metals, namely, steel, copper, and aluminum, it is fairly certain that many projects, for which authorization to start construction is requested of NPA, will be turned down. This situation will be most severe during the first quarter, with perhaps a slight easing during the second quarter, and improving more rapidly thereafter as new production facilities come into operation. A partial offset to this situation will be the substitution of noncritical materials for the critical ones, but, this cannot be done in sufficient volume to negate the effect of CMP.

THREE ADDITIONAL ELEMENTS

Three additional elements affecting construction volume appear to be in a neutral state insofar as 1952 is concerned. The tightness of mortgage money that was apparent around midyear 1951 has eased considerably and probably will not change for the worse in 1952. There might be a slight increase in mortgage interest rates, but, on the whole, it does not seem that mortgage money will either stimulate or retard construction activity in the year ahead.

As far as we can anticipate, the probable over-all increase in wholesale prices and wage rates will be moderate, and, therefore, these factors will neither check nor accelerate building in 1952. This is to say that factors other than prices and wages, reflected in a moderate increase in construction costs, will determine whether or not a particular project proceeds.

In translating the foregoing analysis of the major factors that will have a bearing on 1952 construction activity, it seems obvious that the fourth quarter dip in contract volume will carry over into 1952, and it might even continue through to the middle of the year. If the anticipated improvement in the metals situation and the consequent easing of controls take place, there should be a definite uptrend of contract awards in the second half of the year.

For the year 1952 the F. W. Dodge Corporation has estimated, for the 37 eastern states, a 17% decline from 1951 in new building floor space, corresponding to an 11% decline in dollar volume of building contracts. Table 1 shows the changes in physical volume contemplated for the various major building categories. In Table 2 the building estimates shown in Table 1 have been converted to dollars and combined with heavy engineering work to arrive at an estimate for total construction. These latter estimates allow for an approximate 5% increase in unit construction costs during 1952.

The indicated declines in commercial building and social and recreational projects are in line with curtailments decreed by the National Production Authority.

Moderate declines have been estimated for all other types of building. The indicated 3% decline in new manufacturing floor space may be accompanied by a substantial dollar increase in this classification; the classification included in 1951 several huge atomic energy projects which could only be recorded in estimated dollar values of the contracts, no floor space being available. There are likely to be additional atomic energy plants in 1952.

Military construction is not separately classified in the Dodge statistical tabulations. Military building projects are apt to be classified as commercial, manufacturing, social, and recreational, miscellaneous nonresidential, residential, and so on, according to functional types. Military engineering projects fall into the public works and utilities categories.

The residential volume figure for 1952 is estimated, in conformity with the figure cited by Defense Mobilization Director Charles E. Wilson in his third quarterly report to the President, 850,000 new nonfarm dwelling unit starts in the 48 states. The residential floor space figure reflects an expectation of smaller average units in 1952; the dollar figure, an estimated moderate rise in building costs.

These estimates are believed to be conservative. The actual construction volumes in 1952 are, perhaps, a little more likely to exceed the indicated figures than to fall short of them.

For the longer run, beyond 1952, the outlook is very bright if the people of the United States can solve their problem of crushing taxation and if they can avoid a runaway inflation.

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A Growing Company in a Growing West

1951

. . . a year of balanced progress

The Dayton Power and Light Company Annual Report reveals strength and stability, gives assurance of continued growth

Throughout the 24 counties served by The Dayton Power and Light Company, the problems of the postwar years have been successfully met.

By the end of 1951 construction restrictions resulting from World War II had been overcome. New territories acquired in 1945 and 1948 had been integrated. These accomplishments, each a major achievement, offer examples of what the American team of labor, capital and management can do in abnormal times.

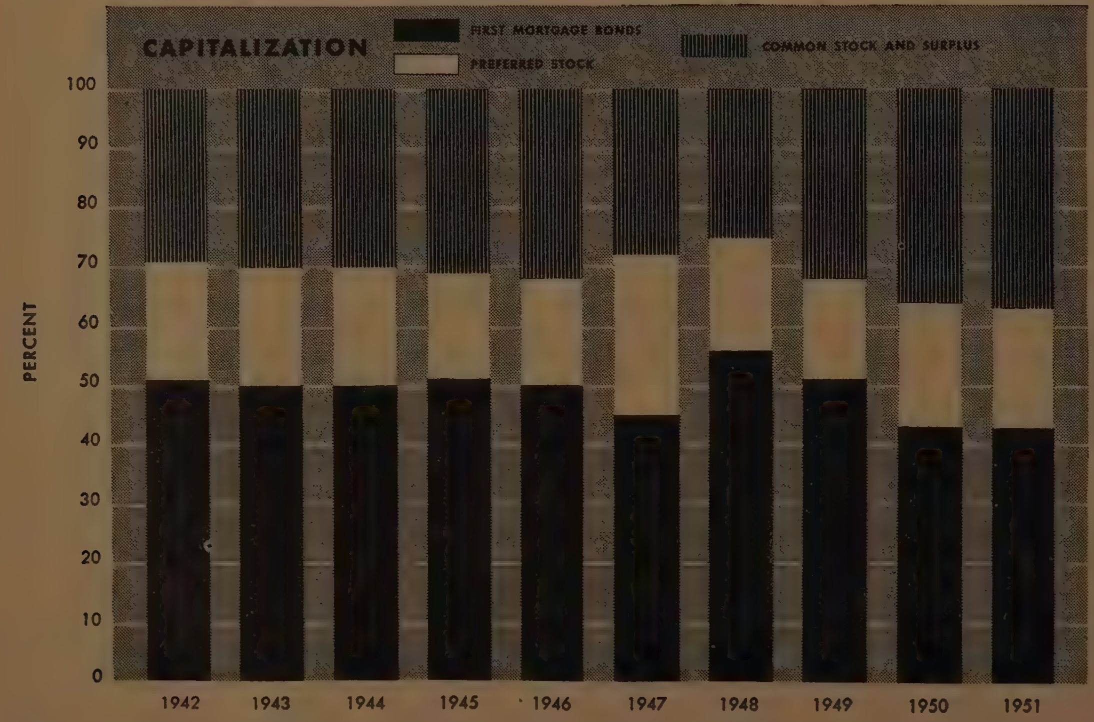
The five-year postwar expansion program (1946-1950) cost $75,227,000. The second five-year program, now under way, resulted in an outlay of $20,400,000 in 1951, and will require an additional $38,000,000 for 1952 and 1953.

The annual report shows an increase in operating revenues from $22,961,000 in 1945 to approximately $49,000,000 in 1951. The sale of electrical energy increased from 874,774,000 kilowatt hours in 1945 to 1,750,000,000 kilowatt hours in 1951. The thousands of cubic feet of gas sold increased from 9,820,000 in 1945 to 24,410,000 in 1951.

The financing of this program not only produced the necessary funds, but also improved the balance in capital structure. The accompanying chart illustrates the results.

WE WILL BE PLEASED TO MAIL YOU A COPY OF OUR 1951 ANNUAL REPORT

a balanced capital structure



The Dayton Power and Light Company • **DAYTON, OHIO**

The Rubber Industry

A History of American Achievement

E. A. ROBERTS

OUR AMERICAN WAY OF LIFE depends very largely on the use of rubber and rubber products. This is an era of swift and comfortable transportation, and tires and other rubber products are one of the important factors contributing to the needs of a Nation that literally rolls on rubber.

Last year, in addition to 66 million passenger-car tires, the rubber industry made 17 million truck tires, 5 million farm implement and tractor tires and considerable quantities of giant excavator and earth-mover tires. Literally every field of operation requires the use of pneumatic tires, not only for highway transportation, but also for use in raising our crops, building roads and airports, flying our airplanes, and a host of other uses.

In addition, it must be realized that every new car has some 200 rubber products that add to our convenience, safety, and comfort. When it is also realized that we sleep on rubber mattresses, use rubber-soled shoes and use rubber in a myriad of miscellaneous and useful products, we know how dependent we are on rubber and the rubber industry.

Furthermore, wars are conducted largely on rubber-tired equipment, because present-day warfare is mobile and conducted largely by the use of vehicles. In addition to tires, rubber is required for tanks, boats, bullet-proof gas tanks, oxygen masks, gun mechanisms, and in many other places where flexibility, strength, and resistance to abrasion is required.

All of our present-day rubber products are taken pretty much for granted, but an analysis of the development of rubber and rubber products indicates that they have closely paralleled the development of the United States, with the result that it has by far the best transportation and the highest standard of living in the world. Like any other historic development, the greatest progress has been made in times of disaster and catastrophe, and this has certainly been true of the rubber industry where more development and progress came out of the war years than during other periods.

EARLY HISTORY OF RUBBER DEVELOPMENT

Looking into the early history of rubber development, we find evidence that, before Columbus' time, the natives of Mexico and the West Indies played games with crude rubber balls and used rubber to waterproof their garments and as soles for their sandals. These were primitive people, and, beyond this point, the use of rubber made no substantial progress for some time.

In 1820 scientists began to experiment with rubber, and in 1839 Charles Goodyear discovered vulcanization. This process of compounding rubber and sulfur, in the presence of heat, made rubber available for the first time in a practical, usable form.

Supplies however were limited since the first of many restriction practices was virtually in effect because Brazil did not allow export of the seeds of rubber trees. Furthermore, they made no attempt to produce any cultivated rubber, and the only rubber obtainable was wild rubber collected by natives, and processed by dipping paddles in the liquid latex and drying over a fire.

SITUATION REMEDIED BY WICKHAM

This situation was remedied when Sir Henry Wickham, an Englishman, smuggled 70,000 rubber tree seeds out of Brazil in 1876. These seeds were germinated in Kew Gardens, London, and transported to Ceylon and Malaya to start the tremendous plantation industry that was to furnish the bulk of our crude rubber supplies from then on.

From this point on, rubber was not too widely used, except in the waterproofing of fabric, until after the turn of the century. At that time our great motorcar and truck industry was beginning to take shape, and rubber began to come into its own as an important factor in the history of transportation. During the first twenty years of the century, cars and trucks, as well as tires, were crude and undependable. Good roads were few and far between, and early cars and trucks made motoring a hazardous and unpredictable project. For the past thirty years, however, hand in hand with the transportation industry, the rubber industry has developed, expanded, and become more efficient, keeping pace with the automotive and transportation industries, to attain the present luxurious and dependable status we enjoy today. In addition to the development of passenger-car and truck tires, the farming equipment was put on rubber, and nearly every operation, such as building roads and airports and mining, was made more efficient by the use of rubber tires.

PRODUCTION IMPROVEMENTS

Let us analyze some of the improvements that led to this tremendous development:

Pneumatic tires made thirty-five years ago were rather crude affairs fashioned from strips of square woven fabric and crudely compounded rubber. Tires were laboriously hand built by forming plies around an iron core, and the fabric body and tread were first cured separately and then given a final cure.

Significant improvements were attained by the introduction of Banbury mixers to replace mixing mills. Cord fabric was introduced to become a much more efficient and satisfactory body strength material and permitted tires to be built on a drum and expanded before curing.

The two-cure method was quickly replaced by the use of integral molds, and tubers were developed to form the tread and side wall in one piece, instead of the plied-up or

	Number of Tires Produced		Per Cent of 1947	
Year	Industry	Armstrong	Industry	Armstrong
1947	100,715,751	4,021,871	100	100
1948	86,726,144	3,922,430	86.1	97.5
1949	81,242,946	3,240,221	80.1	80.6
1950	92,924,810	4,262,478	92.3	106.0
1951*	88,764,470	4,138,470	88.1	102.9

*Year of restrictions.

calender method used formerly. Still later improvements were:

1. The development of high-speed automatic building machines that produced 15 to 20 times as many tires per man-hour as the original core-building methods.
2. Duplex tubers that extruded simultaneously different compounds for the tread and the side wall.
3. Continuous dipping and calendering units that coated the fabric and then applied the insulating rubber compound at speeds as high as 100 yards per minute.
4. An automatic tire-curing process that automatically shaped the drum-built tire, cured it, and ejected the finished tire.

During this period, the tire plants were also steadily being conveyorized to the point where very little hand labor was required to transport the raw and in-process material until it became a finished product.

From a time-saving angle, several significant comparisons are as follows:

1. The Banburys automatically handled larger batches of stock in 2½ minutes than the mills formerly handled in 30 to 40 minutes.
2. The automatic building machines produced 125 to 150 tires per shift, compared to 8 or 10 by the old core method.
3. The Bagomatic presses, with practically automatic operation, cured 3 tires per hour, compared to 2 to more hours per tire required in the early phases of the rubber industry.

ENGINEERING IMPROVEMENTS

During this golden era of production development in the tire industry, corresponding changes were occurring in the development and research fields. Passenger-car rim diameters were gradually reduced from 25 and 23 inches to 15 and 16 inches with a corresponding increase in tire sections from 3½ and 4½ inches up to 6½ to 8 inches. With each forward step taken, inflation pressures were dropped from the former high pressures of 55 and 65 pounds to a point where it was only necessary to use 24 to 38 pounds, each step greatly adding to comfort, safety, and efficiency.

MILEAGES INCREASED

Mileages increased from 3,000 to 4,000 miles to their present national passenger-car tire average of 22,000 miles, even though the requirements from the standpoint of the motorcar became increasingly more severe, owing to the high speeds, larger cars, and greater horsepowers developed. New designs introduced from time to time greatly added to the comfort and speed of automobiles, and tires had to keep pace with demands for noise reduction and better handling characteristics of the improved cars.

CHANGES IN RAW MATERIALS

Equally important changes were also taking place in the raw materials used in making tires. Square woven fabric was replaced by cotton cord, which was steadily improved to increase its strength and fatigue life. This in turn gave way to the use of high-tenacity rayon cord which has been developed to a high degree of durability and efficiency.

Significant changes in the compounding field were also taking place at an accelerated rate over this period. The original treads had very little abrasion resistance until the use of carbon black was introduced. This gave them the reinforcing and abrasion-resisting qualities demanded of tire treads. Similar introduction of black into the carcass gave these compounds improved strength and heat-resisting qualities so much needed for high speed and overload conditions of the later cars and trucks. Still further improvement in carbon blacks have periodically improved mileage and resistance to cracking and added other desirable qualities to tires over the years. Constant research and developments of organic compounds with antioxidant properties have improved the aging qualities of tires to the point where they do not lose their efficiency over a considerable period of years.

One of the significant changes in speeding up the production of tires was the development of accelerators that act as catalysts and speed up the vulcanization, or combining of rubber and sulfur. Without this significant and continuing development, tire plants would be huge, inefficient, costly operations, instead of the efficient, compact, and low-cost producing units they are today.

A very significant safety improvement over the years has been the evolution of satisfactory cord dips, which are the materials bonding the tire cords to the rubber compounds. This is especially true since the advent of rayon and other synthetic fibers. Originally no dip was used, and the adhesion was merely mechanical between the cord and the surrounding rubber compounds. Later on, rubber cements were used to improve this union, and, still later, adhesives gave an even stronger bond. Further development saw the use of materials that chemically bond the cords to the rubber and produce the cohesion between fabric and rubber compounds required for present-day tires.

DEVELOPMENT OF SYNTHETIC RUBBER

The greatest achievement of the rubber industry, however, was the development of synthetic rubber, and this development, like many others, was a matter of extreme necessity. In late 1941, with the country in a war on two fronts, the Allied Nations found themselves facing the catastrophic possibility of having 85% of their supply of crude rubber cut off.

Teams of scientists, engineers, and research workers banded together under the able leadership of the Rubber Director's Office and, slowly but surely, began to make progress on a satisfactory synthetic tire. Ideas and experimental data were pooled, and all the tire companies worked as one unit, with only one realization in mind—*that this program had to be successful.*

BEGAN ERECTING PRODUCTION UNITS

At the first general agreement that a practical synthetic rubber had been developed, the Government began erecting production units, and did a monumental job in the erection and equipping of these units to start production. Inestimable help was received from the suppliers of blacks, accelerators, antioxidants, and the like, in this great development; for instance, new-type carbon blacks were developed which fitted the requirements of synthetic rubber much better than the blacks previously used in crude rubber.

Thousands of experiments and hundreds of road tests, as well as factory runs, were made to further the development of synthetic rubber. Every bit of knowledge learned by each individual company found its way to the common pool of information, with the result that rapid progress was made in the development and practical use of GRS (butadiene-styrene type) synthetic rubber.

As knowledge in the use and manufacture of synthetic rubber rapidly increased, the amount used in all tires was likewise increased. Passenger tires were made in which 99% of the new rubber used was synthetic, and many large truck and airplane tires were successfully made with a synthetic rubber content as high as 62%. We all know that the success of this synthetic rubber program was one of the vital factors in winning a mobile type of war fought almost entirely on rubber-shod wheels.

A further major improvement was the development of low-temperature or cold-polymer GRS. Activators had to be developed to give a short reaction time without the aid of high temperatures. The resultant rubber has better flexibility and efficiency and results in 30% improvement in tread life. The Armstrong Rubber Company can justifiably claim a considerable share of credit for this development, not only in some of the original thinking but because they helped solve some of the knotty production problems involved in bringing this development to the production stage.

In still another field of development, the war years produced butyl synthetic rubber, which has proven to be vastly superior to crude rubber in the manufacture of inner tubes. In addition to having greater tear resistance, butyl rubber has 7 to 10 times as much resistance to air loss as crude rubber. Butyl has contributed a great deal toward remedying underinflation and its attendant evils in passenger tires, and it is doubtful if the present extra-low-pressure line of passenger tires, which greatly improved the safety and riding comfort of present-day cars, would have been a complete success without the improvement in air retention resulting from the use of butyl.

Since GRS synthetic rubber did not make satisfactory inner tubes, butyl replaced crude rubber in the manufacture of tubes, with the net result of better performance at greatly reduced cost.

A still later development, which effects a reduction in cost, is the development of a tougher type of polymer to which enough plasticizer is added to make it workable. The resultant rubber is equal in quality to the former type, and the cost is definitely lowered by the added use of low-cost plasticizer.

FUTURE DEVELOPMENTS

Every year a number of new developments are announced which constitute radical improvements in the life and service of pneumatic tires.

In the field of cord fabrics, there has already been extensive development of tires, with synthetic fibers having certain marked advantages over the present rayon, and even the rayon itself is being constantly improved to give it greater strength and fatigue life. Each new development is an additional tool in the hands of the tire engineer to make tires for various types of service give better performance, with a resulting lower cost to the operator.

As for compounding, dozens of new carbon blacks, antioxidants, and accelerators are under development, with many showing promising results.

In the field of tire design, Armstrong has recognized that there is crying need for improved traction on the newer-type cars because of the fact that they have higher horsepower to weight ratios. One of their significant new developments will be the introduction of a quiet, long-wearing tire having interlocking tread elements instead of ribs. This gives the tire greater flexibility and more gripping edges, greatly increasing the traction qualities of the tire. This tire also contains a feature to prevent squeal on curves.

Continual improvement in the rubber industry is guaranteed by the large technical and research staffs that the companies maintain, together with numerous test machines and test fleets capable of evaluating tires under the most grueling conditions. Their past record of development and improvement of product and production methods definitely stamps the tire industry as a very progressive factor in our civilian and military economy.

INCREASED USAGE

Not content with improving tire service and production methods, the rubber industry also has taken many significant steps toward expanding the usage of tires. Much effort was spent to demonstrate to the farmer that he could not only reduce operating costs but also increase the usefulness of tractors and farm implements by putting them on rubber tires, so that they could move over the highway as well as in the field. As a result of continuous co-operation with manufacturers of excavating and earth-moving machinery, nearly all these vehicles are equipped with giant heavy-duty tire equipment, thus expanding and increasing the field of usefulness of the tire indusrty. In nearly every field of operation, including surface and subterranean mining, pneumatic tires have proved to be a boon in reducing operating costs and increasing efficiency, and new fields are being explored and developed daily for their usage.

Another factor influencing the total poundage of tires used is that rising labor costs have forced many truckers to purchase bigger trucks, with correspondingly larger tires, so that more tons can be hauled per man-hour. This has forced a realignment in the curing press capacity of the various plants, obsoleting more small molds and presses, and developing a corresponding shortage in the large-size presses. The end result, however, is that the trucking industry has gained more efficiency and customer acceptance, and the rubber industry progressed accordingly.

In military operations, also, the rubber industry has expanded its usefulness. Fantastic quantities of tires, tank blocks, and other rubber parts are absolutely essential to the defense effort, and, in addition, larger tires are being provided to obtain better flotation, thus adding further to the part played by the rubber industry.

ANALYSIS OF FIRMS IN THE TIRE MANUFACTURING INDUSTRY

The tire manufacturing industry is composed of 19 companies: 4 large companies, 2 medium sized, 6 somewhat smaller, and 7 relatively small companies. An analysis of the problems of the small companies indicates that they have had indifferent success in the past few years and would have fallen even farther behind without the stimuli of shortages and the defense effort. With their small production volume, it can readily be seen that their individual budgets for technical research and testing could not allow them to be a real factor in primary development and pioneering of new and improved products. It therefore follows that their business is rather confined to the smaller, large-volume sizes at somewhat lower price levels, to give their product salability, even without benefit of large advertising and technical budgets. Thus, amalgamation with larger firms, or at best a rather static condition, faces the small tire manufacturing firms, especially in the readily forthcoming balanced supply and demand tire market.

Turning next to an analysis of the four large companies, we find all of them in such a race for the top-rung position in volume that it was necessary for them to branch out far afield from their original tire manufacturing endeavors. Some of them have successfully invaded the fields of airplane and gun manufacture, and other phases of metal fabrication, as well as the more related fields of plastics and chemicals.

Still other phases of growth necessitated their establishment of foreign plants as an adjunct to volume increase. From a distribution standpoint, the establishment of company-owned stores put them in the business of marketing not only tires and tubes, but also gasoline, oil, automotive accessories, appliances, radio and television sets, tools, sporting equipment, and toys. Various competitive practices over the years have resulted in somewhat major shifting of customer requirements, with the result that each of these companies has vast unused reserves of passenger-car molds and equipment.

Another factor inevitably follows in the wake of such expansion. Designs and products obsoleted or surpassed by more recent developments are often carried along far past their stage of usefulness, simply by the sheer weight of advertising and sales effort expended in the past.

Concerning the large tire companies, four major conclusions can be drawn at this point:

1. The inertia of making design improvements and modernization of equipment is necessarily hampered by the very bulk of molds, equipment, and machinery involved and the huge cost of replacement or revision.
2. Diversification of their efforts has not improved their concentration on the original target—that of making tires.
3. Managements have become large and naturally less capable of rapid, cohesive, and decisive action.
4. Difficulties are experienced in the elimination of obsolete and inefficient designs, equipment, and ideas.

Looking toward the medium-size companies, we can see the greatest per cent of growth in the past few years and can look for a similar trend in the future. The Armstrong Rubber Company, being one of the two medium-size companies, furnishes the statistics to support this statement. 1947 was by far the year of greatest production—the high point in the tire manufacturing industry. If we take this year as a norm of 100%, Armstrong produced 106% as many tires in 1950 and 102.9% as many in 1951 as in 1947, while the industry tire production as a whole declined to the point where they made only 92.3% as many tires in 1950, and 88.1% as many in 1951 as in 1947. This indicates a relative growth for Armstrong in this period of 14.8% for 1950 and 16.7% in 1951. Figures for the five-year period are shown in the accompanying table.

Armstrong can be regarded as fairly typical of the medium-sized tire manufacturing firms with possibly one major policy exception: They have spent more of their overhead dollar on their technical staffs, equipment, and fleet testing than the average, and only in recent years have felt that increased volume of business justified a sizable advertising budget.

Starting in 1912 Armstrong has steadily grown to a daily production capacity of 24,000 tires and is now a four-plant operation with further expansion planned for the near future. Reasons for the growth of this size unit can be summed up as follows:

1. Adequate volume of business to support technical staffs, and research and test programs for product improvements and new developments.
2. Greater ability to modernize and make design improvements because less equipment is involved.
3. Plants with 5,000 to 7,000 daily tire capacity are most efficient tire production units when compared with either small or huge plants.
4. Ability to follow latest trends and new developments, unhampered by the frequently static effect of jettisoning products on which millions have been expended in advertising and sales promotion.
5. Concentration on the development and improvement of tires and tubes.
6. Efficiency gained by the closely knit association of management, technical, and sales groups, providing greater flexibility and a capacity for faster, more efficient, and cohesive progress and accomplishment.

To summarize, it can be concluded that the moderately large tire manufacturing firms, having good management and a policy of putting a distinct emphasis on forward-looking technical personnel, equipped with adequate research and testing facilities, can look ahead to a steady upward progress in the rubber manufacturing industry.

ECONOMIC ASPECTS

The rubber industry has never been much of a factor in the recent spiral of inflation tendencies. Until 1951, when the price of crude rubber ballooned upward and the cost of labor and other materials soared to an all-time high, it was able to keep prices practically to a prewar level.

That this price level could be maintained through 1950 because improvements in manufacturing methods pretty largely compensated for rising costs up to that time is a tribute to the progress effected. During the years 1948 through 1950, the tire-producing companies in the rubber industry had sales averaging somewhat under $3 billion and never, in any one of these years, had average profits exceeding 5%. This indicates that the public was given the advantage of good management and steady improvement and development, with a very low per cent of profit to the manufacturer. On the other hand, however, the entire rubber industry has consistently kept itself in the position of acquiring new and up-to-date machinery and equipment which constitute sound investment against the future.

STABILIZING EFFECT OF SYNTHETIC RUBBER

During the year 1951, less than 15% of the new rubber used in the 66 million passenger tires produced was crude rubber.

As the price of GRS synthetic rubber can be averaged at 25.5 cents per pound, against 52.2 cents for crude rubber, for the first six months of 1951, it can readily be seen that a tremendous saving was passed on to the public by the development of synthetic rubber. Simple mathematics show that this differential of 26.7 cents per pound times the 7 to 7½ pounds of synthetic used per tire represents a saving of nearly $2 per tire. Thus, on 66 million passenger tires, this savings amounts to $125 million. Add to this a saving of 90 cents per tire for 17 million truck tires and $2.50 per tire for 5 million tractor tires, and the savings total some $150 million, which is roughly equivalent to the 1950 total net earnings of the tire manufacturing industry.

A far more significant factor, however, is the impact on the world rubber market of this country's huge facilities for the production of synthetic rubber. The American rubber industry in the past has been at the mercy of world politics, especially in respect to the nations controlling crude rubber production. In spite of the synthetic production, the year 1951 was no exception to this fact because of the huge stockpiling requirements necessary.

However, the stockpiling requirements should be met in 1952, and the ability of the United States to market tires made largely of synthetic rubber will then necessitate a maintenance of normal prices of crude rubber, in order for any other nation to be competitive in the world market. Thus, by virtue of this one development alone, this country has produced a leavening factor in the worldwide rubber industry.

The principal recipient of this beneficial action, of course, will be our own country, who, in spite of its synthetic production, is still the principal user of crude rubber. The combination of these two factors will more than ever allow the United States to dominate the rubber industries of the world by providing more and better products at lower cost.

The foregoing analysis merely contributes a few shreds of evidence that the American rubber industry is a well-managed, farsighted and efficient branch of American industry with a creditable past and a future, dedicated to an ever-expanding field of usefulness and progress.

* * *

France in Inflation

May 1718 . . . Gold and silver coinage debased 40%.

January 1719 . . . Notes issued by the Royal Bank.

The rise of John Law brought spending power to the buyers. Commodity prices increased slightly. Late in 1719 they rose more with a tremendous bull market in Law shares.

1720 . . . Early in year, contraction efforts—late in year, the inflation efforts collapsed. . . . Law fled to Belgium. . . . His country suffered a difficult depression.

Dresser Financial Summary

Consolidated totals for Dresser Industries, Inc. and Subsidiaries owned during the years indicated are presented in light-face type. Combined totals for all present Dresser companies without regard to date of acquisition are presented in **dark-face** type.

	1951	1950	1949	1948	1947
			IN THOUSANDS OF DOLLARS		
Net sales	106,148	79,969	80,630	108,637	80,095
			84,336	**89,888**	**63,243**
Profit before taxes on income	10,419	7,650	5,670	12,648	7,657
			5,564	**10,092**	**5,235**
Taxes on income	5,303	3,321	2,145	4,610	3,218
			2,113	**3,534**	**2,027**
Net earnings	5,116	4,303	3,525	8,038	4,439
			3,426	**6,528**	**3,179**
Working capital	42,303	35,621	35,622	33,209	24,415
			38,007	**25,826**	**19,665**
Property, plant and equipment — net	16,584	15,574	14,089	14,842	11,501
			15,459	**13,428**	**10,063**
Expenditures for property, plant and equipment	3,519	2,363	3,700	4,575	2,926
			3,872	**4,570**	**2,924**
Shareholders' equity	49,236	41,475	38,652	37,266	30,484
			IN DOLLARS PER SHARE		
Earnings per common share	3.77	3.68	3.02	7.14	3.85
		3.15	**2.47**	**4.85**	**2.27**
Dividends per common share	1.40	1.40	1.875	1.125	—
Book value per common share	33.52	32.20	30.02	28.69	22.44

Note A—Net earnings and related figures have been revised to include, in the proper year, final renegotiation settlements and other subsequent adjustments to income retained for use in the business.

Note B—Earnings, dividends, and book value per common share have been adjusted to basis of present 50c par value shares.

Note C—Pro-forma earnings per common share (dark figures) are based on 1,300,000 shares of common stock presently outstanding.

DRESSER INDUSTRIES, INC.
OIL, GAS AND CHEMICAL EQUIPMENT

ATLANTIC BUILDING
DALLAS, TEXAS

A GROUP OF COMPANIES
UNDER COMMON OWNERSHIP

BOVAIRD & SEYFANG MANUFACTURING COMPANY
Bradford, Pa.—Founded 1891

CLARK BROS. CO., INC.
Olean, N. Y.—Founded 1880

DRESSER MANUFACTURING DIVISION
Bradford, Pa.—Founded 1880

DRESSER MANUFACTURING COMPANY, LIMITED
Toronto, Ont., Canada—Founded 1931

IDECO DIVISION, *Dresser Equipment Company*
Dallas and Beaumont, Texas; Columbus and Delaware, Ohio
Torrance, Calif.—Founded 1920

KOBE, INC., DIVISION, *Dresser Equipment Company*
Huntington Park, Calif.—Founded 1923

MAGNET COVE BARIUM CORPORATION
Houston, Texas; Malvern, Arkansas—Founded 1940

PACIFIC PUMPS, INC.
Huntington Park, Calif.—Founded 1923

ROOTS-CONNERSVILLE BLOWER CORPORATION
Connersville, Ind.—Founded 1854

SECURITY ENGINEERING CO., INC.
Whittier, Calif.—Founded 1931

THE STACEY BROS. GAS CONSTRUCTION COMPANY
Cincinnati, Ohio—Founded 1915

Technological Progress and Petroleum Securities

J. A. COGAN

THE PARALLELISM BETWEEN technological growth and the marked rise in value of petroleum securities over the years is no mere random relation. It is obvious that, but for continued scientific progress, the market for petroleum products would long since have tended to stagnate. It is almost equally clear that the development of petroleum products in suitable volumes and of improved quality has contributed in important measure to the general technological advance.

From the standpoint of the investor, looking at the long-range prospects, the petroleum industry is in the fortunate position that the two prime requisites for a successful business undertaking—an adequate market and an adequate source of supply—are favorably affected, on balance, by technical developments. In support of this conclusion, it may be of interest to consider briefly the historical and prospective future impact of advancing technology on some of the component factors of petroleum demand and supply.

On the demand side, by far the most important use of petroleum is as a source of liquid energy, upwards of 90% of a barrel of oil being utilized for this purpose. The energy market in the United States, reflecting the improving standards of living brought about by technological change, has over the past half-century averaged a growth of approximately 3% per year. Of course there have been cyclical setbacks, particularly in the depression of the early '30's, but the basic upward trend has always reasserted itself. There appears to be no reason to anticipate any persistent reversal in this trend, and an estimate of an average growth of 2% each year in the energy utilized in this country over the next decade appears conservative.

Petroleum's participation in supplying these energy needs has been steadily mounting. Twenty-five years ago petroleum supplied about 20% of the Nation's energy. By 1950 not only had the total energy load increased by two thirds, but also petroleum covered 40% of this higher total need, with natural gas accounting for another 18%. Much of this increase, over the years, was, of course, brought about by the revolutionary developments in transportation, featuring oil-consuming equipment: the automobile, the Diesel engine, the airplane, the oil-burning ships. More recently the convenience of oil as a heating fuel has contributed strongly to a further upsurge in petroleum's consumption position.

With respect to the future it is quite possible that the rate at which petroleum has been increasing its percentage participation in the over-all energy picture will gradually decelerate. In its pre-eminent field of transportation, petroleum consumption will, of course, receive added impetus from aviation progress—particularly in the jet-propelled plane. Although the growths in gasoline consumption in motorcars and Diesel for railroads will add steady large increments to demand, they will not reflect the same sensational percentage increases of the past. Technological progress in the form of the large gas pipe lines and possible technical improvements in coal production and handling may, through their economic impact, slow up the headlong gains of petroleum in the heating field. Progress in petroleum refining techniques to maximize the more valuable products in the barrel is tending to limit the supplies of the by-product residual fuel oil for use under boilers. Energy for heating and power purposes may, in the future, of course, come from scientific advances in the utilization of atomic and solar sources. However, the widespread application of these sources on an economic basis appears to be far enough distant that for the present it seems sufficient merely to keep an eye on their course of development.

It should be made clear that the items discussed in the preceding paragraph are merely modifying factors on the rate of growth in petroleum consumption. On balance, the continuing rise in energy utilization and the maintenance of a high-percentage position by petroleum will yield continuing volumetric increases in petroleum demand which will keep the industry active and expanding.

The question may well be asked whether scientific advances in the form of improved efficiency of utilization of fuels will not tend to offset increasing energy demands. It is quite clear that continued advances in efficiency may be anticipated, but past experience would appear useful in judging the probable impact. An interesting and well-known example of improvement in fuel utilization is that of motor gasoline in the family car. Through hand-in-hand improvement in engine design and in quality of motor gasoline, today's car secures some 50% more useful energy from a gallon of gasoline than its counterpart did twenty-five years ago. Far from decreasing gasoline consumption, this added output has vastly improved performance and increased the consumer appetite for the product. Expressed in more general terms, it appears that, in the long-run, improved efficiencies are reflected not in decreased energy demands but in improved standards of living.

Although this discussion is intended to deal with petroleum in the United States, a parenthetical reference to the foreign area may be of interest as reflecting its huge potential growth in demand. From an energy standpoint the per capita consumption in the rest of the world is but 8% of that in the United States. Furthermore, although it is growing rapidly, the proportion of this foreign energy load at present supplied from petroleum is 22%, compared to the 40% in the United States mentioned previously. Add to this the factors abroad of a rather unfavorable coal supply situation and vast petroleum reserves, and it is not difficult to conclude that, as the foreign standard of living rises, and, in fact, in order to permit it to rise, tremendous potential requirements for petroleum must be filled outside of the United States.

It is only relative to the staggering volumes of fuels that the uses of petroleum products for other than energy purposes can be considered small, for, in an absolute sense, they are really very large. Such uses run into the hundreds of millions of pounds each year and are proportionately more important in terms of value than of quantity. Lubricants are indispensable to the machine age, and continued technological progress means a continuing challenge to the ingenuity of the petroleum industry, to supply in quantity the ever more exacting quality demands. Use of petroleum asphalt is steadily rising, particularly as efforts are made to keep up with the backlog of road construction. Use of so-called "asphaltic concrete" on new superhighways, such as the recently opened New Jersey Turnpike, may herald even greater participation of asphalt in the future. Wax is an interesting example of a petroleum specialty, where a declining use of candles has been manyfold offset by technical developments featuring new uses for a wide range of petroleum waxes.

A relatively new field for petroleum is as a raw material for production of organic chemicals. Out of the research laboratory into plant production on a major scale have come alcohols, aromatics, synthetic rubbers, plastic intermediates, synthetic fibers, and so on. With a phenomenal growth from 6 million pounds in 1925 to an estimated 14.5 billion pounds in 1950, chemicals from petroleum reflect a sharp multiplication in market value of the approximately 1% of the petroleum barrel that they now require. The petroleum-chemical field is still rapidly expanding, and its sensational rate of growth may be expected to continue far into the future. Petroleum is and will continue to be a main source of organic chemicals.

The expansion of petroleum markets which we have been discussing is, of course, dependent on development of the corresponding supplies on an economic basis. What does advancing technology promise on this score?

I shall not attempt an estimate of the ultimate crude oil reserves to be discovered in the country, since experience has shown that every guess of this sort that has been made in the past has had to be revised sharply upward very shortly, due to technological progress and changes in economic conditions. It may be of interest, however, to comment briefly on three types of development which have contributed greatly in the recent past and will contribute in important ways in the future to new discoveries of oil.

1. Improved methods of drilling, making it possible to reach greater depths, thus extending vertically downward the portion of the earth's crust that may be probed in search of oil. Twenty-five years ago the deepest hole ever drilled was about 8,000 feet, whereas now the bit has reached more than 20,000 feet or almost 4 miles below the earth's surface.

2. Continuation and extension of intensive exploration in both old and new areas, thus extending horizontally the known productive areas. As a result of this exploratory work, six states have been added to this country's producing list in the last fifteen years. In the last one added (North Dakota), the first discovery found oil at a depth greater than the industry was able to drill fifteen years ago. Extension to potentially important undersea areas has been made possible by progress in drilling techniques.

3. Technological improvements in old exploratory methods and in the understanding of them and the development of new methods and techniques. Geological and geophysical methods used in exploring for oil are continually being refined to make them more broadly applicable. At the same time, the improved understanding of their application and meaning, which has come from experience, has made them more effective. Other such improvements can be expected confidently over the future. Research has resulted in better knowledge of the behavior of underground reservoirs of oil so that operators today are able to bring to the surface in some cases two or three times as much oil from a field as was once thought to be the maximum recoverable. In addition to the improved conservation practices utilizing more effectively the natural reservoir energies, there is a growing interest in secondary recovery. As technology and economics make it possible, very large additions to the country's effective reserve will come via this route.

Besides the natural petroleum resources at home, the American petroleum industry has already developed large foreign petroleum reserves, and, as in the United States, these foreign areas have huge potentialities for future oil discoveries. These foreign resources are available to supplement the natural petroleum supplies within our own borders.

In addition to natural crude petroleum, the petroleum industry can and will at the appropriate time in the future draw upon other sources to maintain its liquid fuel business. Operable methods have been developed for securing liquid fuels from natural gas, shale oil, tar sands, and coal, and will be used when economically practicable. The long-range interest of the petroleum industry in these substitute sources has been shown by its prominent part and heavy research expenditures in developing the processes and by such steps as long-term leases on shale oil lands.

New and increased uses and new sources of supplies are, of course, of little more than academic interest unless they meet the test of economic competition. Technology has been of inestimable value in keeping petroleum products in the low price range that has contributed so much to the demand for them. To return to an earlier example, technical progress has made it possible for today's motor gasoline of sharply improved quality to be sold to the consumer at approximately the same price as the inferior product of twenty-five years ago, notwithstanding general sharp inflation. Such a result has been made possible not alone by the more heralded advances in producing and refining technology but also by transportation developments, such as Big Inch type pipe lines and supertankers, and markedly improved distribution and marketing techniques.

Although the degree of assistance that motor gasoline has enjoyed in cost reduction methods in recent years is greater than can be hoped for in general, it is still reasonable to believe that technological progress will continue as a major factor in keeping petroleum products relatively cost-competitive. The petroleum industry does not, of course, leave to chance technical developments having a direct bearing on the business. Its research activities are among the most extensive, well organized, and successful of any industry. In short, the petroleum industry, which has been one of those benefiting most from technological developments in the past, confidently expects to maintain this position.

Agricultural Frit

A Synthetic Mineral for Agriculture, Containing Trace Elements

CHARLES A. VANA

TRACE ELEMENTS are a specific group of elements required in very minute amounts to catalyze metabolism of plants and animals. Their origin is mineral rock which is converted to soil, subsequently assimilated by plants, and then translocated to animals which consume the plants. The plant physiologist is the professional who deals with the trace element uptake by plants from the soil. The medical profession today also recognizes these elements as activators in body functions to produce good health.

INTEREST INCREASING IN RECENT YEARS

This interest has been increasing in recent years and is worldwide. It has even attracted the attention of the United Nations, because the lack of specific trace elements produces food shortages and malnutrition in some countries, which in turn produce malcontent in the status quo of these nations. We may coin an allegory based on a well-known commercial slogan—the well-fed cow produces a "contented" nation.

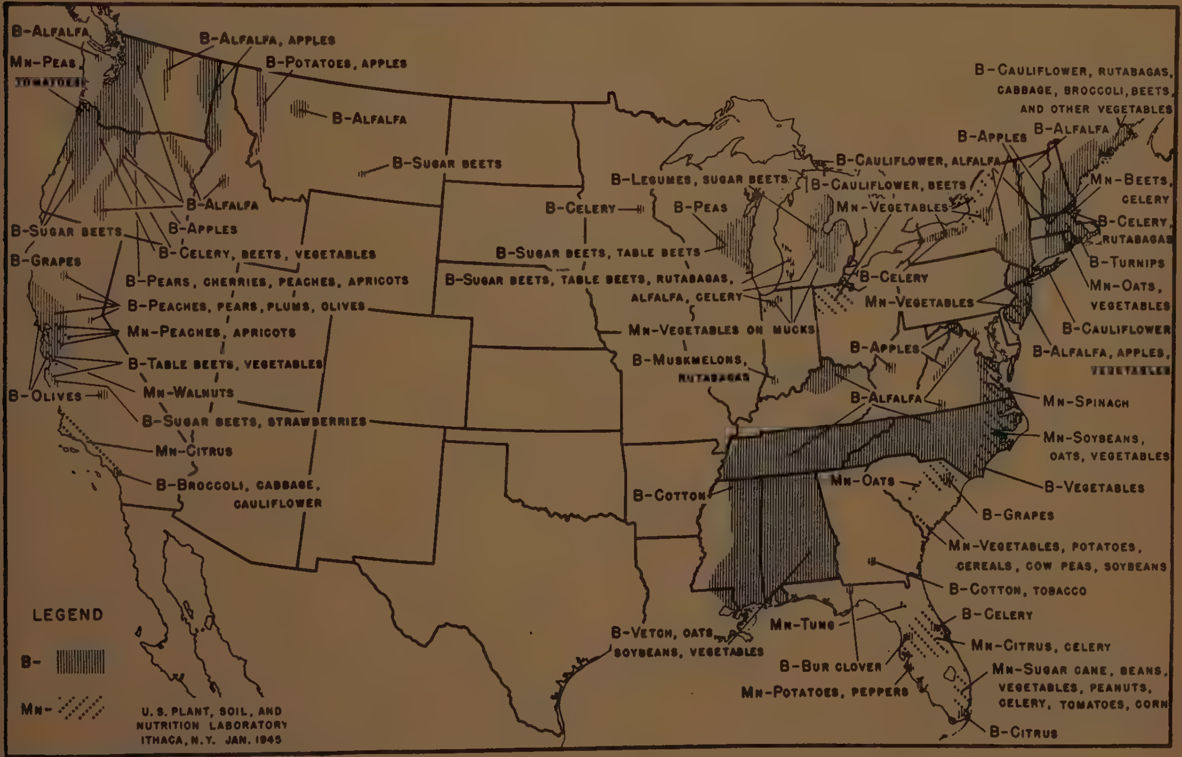
The present composition of the human body is the result of evolutionary changes or adjustments for eons brought about by consumption of vegetation by animals. The established trace elements in the body must be maintained to produce good health. We know that nutrition is an important factor in the prevention and cure of tuberculosis.

UPTAKE OF ELEMENTS BY PLANTS

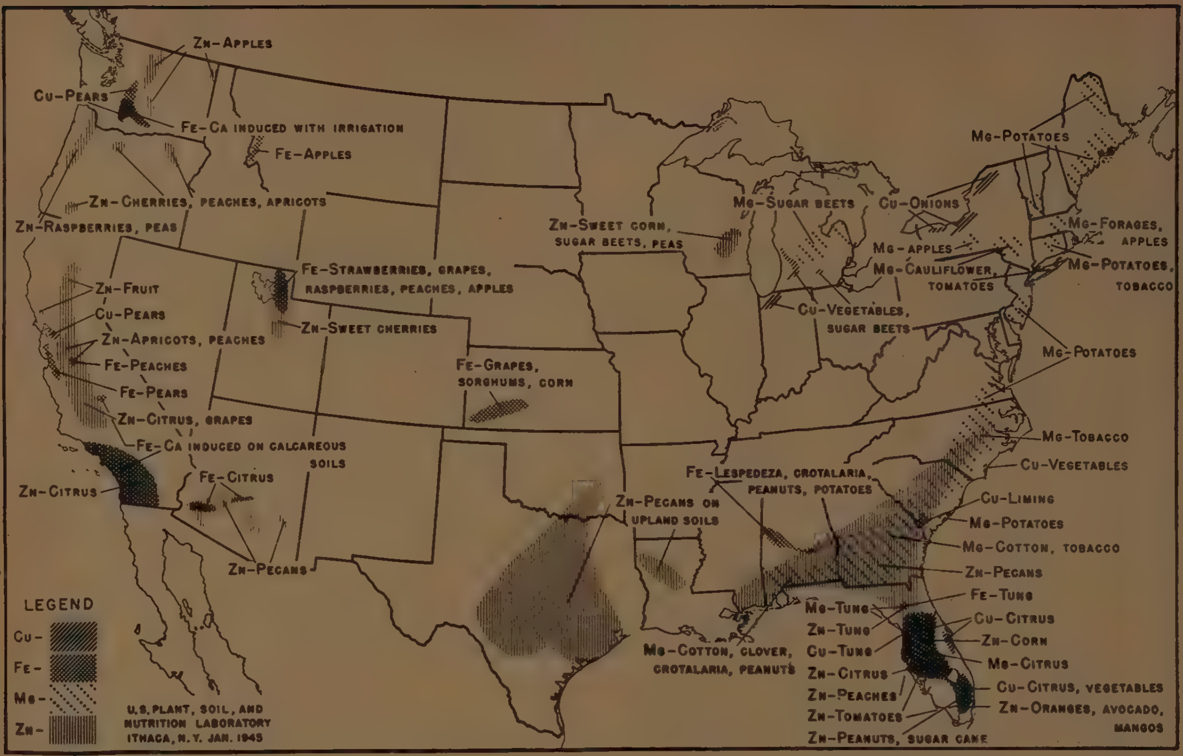
It is unnatural to partake of the trace elements orally, as salts; therefore we must concern ourselves with the primary uptake of the elements by plants. It is not quite true that all trace elements required by man are those that are essential to good plant growth. Iron, manganese, copper, and zinc are required by both animals and plants, whereas

Figure 1. Generalized Map of the Occurrence of Boron and Manganese Deficiencies in Plants

Although the deficient areas are necessarily shown as continuous, they are actually intermittent in character. Modifications of these areas will be possible as more data become available


B-Alfalfa
Mn-Peas
Tomatoes
B-Alfalfa, apples
B-Potatoes, apples
B-Alfalfa
B-Sugar beets
B-Alfalfa
B-Apples
B-Sugar beets
B-Grapes
B-Celery, beets, vegetables
B-Pears, cherries, peaches, apricots
B-Peaches, pears, plums, olives
Mn-Peaches, apricots
B-Table beets, vegetables
B-Olives
Mn-Walnuts
B-Sugar beets, strawberries
Mn-Citrus
B-Broccoli, cabbage, cauliflower
B-Cauliflower, rutabagas, cabbage, broccoli, beets, and other vegetables
B-Apples
B-Alfalfa
B-Cauliflower, alfalfa
B-Legumes, sugar beets
B-Cauliflower, beets
B-Celery
B-Peas
Mn-Vegetables
Mn-Beets, celery
B-Celery, rutabagas
B-Sugar beets, table beets
B-Turnips
B-Sugar beets, table beets, rutabagas, alfalfa, celery
B-Celery
Mn-Vegetables
Mn-Oats, vegetables
Mn-Vegetables on mucks
B-Cauliflower
B-Apples
B-Alfalfa, apples, vegetables
B-Muskmelons, rutabagas
B-Alfalfa
Mn-Spinach
Mn-Soybeans, oats, vegetables
Mn-Oats
B-Cotton
B-Vegetables
B-Grapes
Mn-Vegetables, potatoes, cereals, cow peas, soybeans
B-Cotton, tobacco
B-Celery
Mn-Tung
B-Vetch, oats, soybeans, vegetables
Mn-Citrus, celery
B-Bur clover
Mn-Sugar cane, beans, vegetables, peanuts, celery, tomatoes, corn
Mn-Potatoes, peppers
B-Citrus
LEGEND
B-
Mn-
U. S. PLANT, SOIL, AND NUTRITION LABORATORY ITHACA, N.Y. JAN. 1945

U.S. DEPARTMENT OF AGRICULTURE



U.S. DEPARTMENT OF AGRICULTURE

Figure 2. Generalized Map of the Occurrence of Copper, Iron, Magnesium, and Zinc Deficiencies in Plants

Although the deficient areas are necessarily shown as continuous, they are actually intermittent in character. Modification of these areas will be possible as more data become available

cobalt and iodine are indispensable to animals only, and boron and molybdenum are required by plants.

The positive function of each element may be disputable. However, there is wide agreement that iron is an essential part of blood, manganese aids bone formation, cobalt is required for B12 vitamin synthesis, iodine helps prevent goiter, and boron promotes plant root formation.

WIDE AREAS PRODUCE BELOW PAR

Agricultural authorities in universities and state agricultural experiment stations tell us there are wide areas of farmland in the United States which produce below par because the soil lacks one or more of the plant trace elements.

MAPS BY AGRICULTURE DEPARTMENT

Figures 1 and 2 are maps prepared by the U. S. Department of Agriculture,* showing the deficient areas in this country.

FLORIDA AND COASTAL PLAINS NOTEWORTHY

Florida and the Coastal Plains are noteworthy because the trace elements are leached from the sandy soils of these areas. On the other hand, in some areas these elements may be present in the soil, but are not "available" to the plants; this is notably true of the West Coast, where the soil is alkaline.

It is estimated that millions of dollars have been spent on agricultural research in these areas with regard to deficiencies, and the research is still in progress with even increased effort.

COMMERCIAL TRACE ELEMENT NOW ON THE MARKET

The common commercial source of trace elements up to this time has been soluble salts usually in the sulfate form. Owing to the soluble nature of the salts, it is common for these salts (1) to be leached from the soil by rain water, (2) to be sensitive to the plant roots or be toxic when accidentally used in excessive amounts, and (3) to tie up with the soil and be made unavailable.

AGRICULTURAL FRIT—NEW SOURCE OF TRACE ELEMENTS

It was conceived that a relatively insoluble mineral containing the trace elements might be developed to eliminate the drawbacks of the soluble salts. The central research division of Ferro Corporation undertook a research program to synthesize such a mineral. The fundamental concept behind this search was to develop a mineral that would supply the trace elements to plants essentially by root con-

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*Kenneth C. Beeson (director of the U. S. Plant Soil and Nutritional Laboratory, Ithaca, N. Y.), *Fertilizer Review,* March–April 1948.

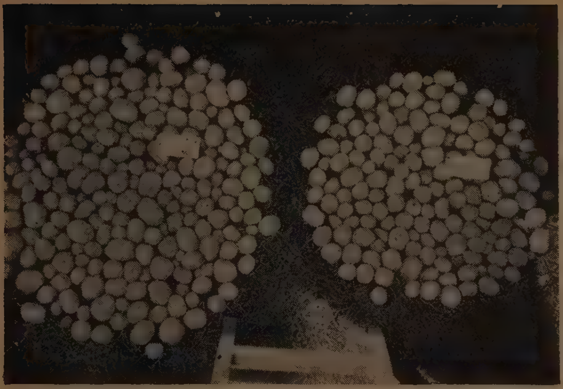

Figure 3. Greater Yield of Potatoes Obtained with 200 Pounds of Frit per Acre on a Deficient Soil

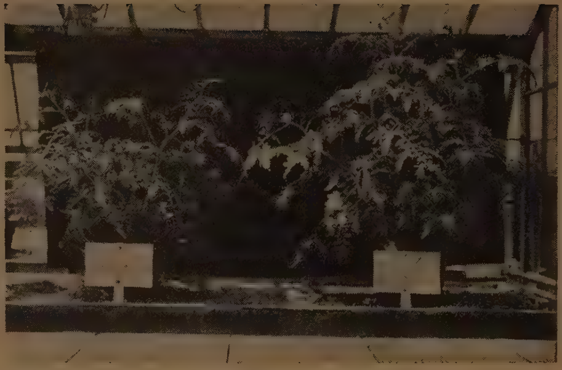

Figure 4. Showing Effectiveness of Frit by Growing Tomatoes in Sand Culture, Compared with a Control Containing Soluble Trace Elements

tact with the mineral. This concept had a basis in a publication by H. Jenny and R. Overstreet of the University of California† when they revealed work on the cation uptake by roots from clay particles.

FERRO'S LINE OF PRODUCTION

It was realized that the manufacture of such a mineral would not be out of line with Ferro's line of production, because the required personnel and suitable equipment already existed for the current manufacture of their porcelain enamel frit.

RESEARCH FOR PAST FIVE YEARS

The central research division of the company has been pursuing research in this field for the past five years. Research work has also been sponsored at several colleges, notable at Michigan State College, E. Lansing, Mich., where basic investigations have been carried out in the department of botany and plant pathology.

APPROACHED IN METHODICAL ORDER

The research program was approached in a methodical order, an iron-containing mineral being studied first, and then one containing iron and manganese, with the eventual goal of having all the trace elements embodied. The early work at Michigan State College has been published in an entire issue of *Lloydia,* a quarterly publication‡ covering experiments on the Availability to Wheat Plants of Iron in Very Insoluble Glass Frits, Response of Snapdragons to Very Insoluble Iron-Containing Frit, Absorption of Manganese and Iron by Navy Bean Plants Grown in a Calcareous Soil Fertilized with a Manganese-Containing Glassy Frit, and Response of Chlorotic Blueberry Bushes to a Very Insoluble Iron-Containing Glassy Frit. Additional articles describing further researches of this nature are in the press.

Since the ultimate application of the mineral was to be in agriculture, it was decided to identify it by the descriptive name of "agricultural frit." This material should not be confused with another product previously promoted under the same identification. Ferro's product is entirely different in chemical composition and physical structure, and is the result of intense academic research.

WILL PROMOTE GOOD GROWTH

Ferro's agricultural frit will release trace elements to the plant at a rate to promote good growth; thus, the elusive problem of applying just the right amount of soluble trace elements is eliminated. The product can be applied to the soil over wide rates of application without toxic effects. It is expected that, once the grower puts the product in the soil, the trace element problem may be forgotten.

Agricultural frit simulates natural minerals which nature uses to grow sturdy trees and delicate blades of pasture grass. However, the natural rock must be weathered to release the trace elements, whereas agricultural frit is ready to release the trace elements to perform at once the functions of the weathered rock.

Its composition is based on proven ratios of the trace elements to each other, with the ultimate objective of having all the essential trace elements in balance. Needless to say, some frits have been made with only one specific trace element for application where just that specific element is known to be deficient.

Many unusual properties of the frit may be anticipated because of its activated surface. It will be revealed shortly by way of a publication that the frit will check the toxicity of excessive amounts of soluble manganese when the frit is present.

The ability of agricultural frit to release trace elements to the root hairs of plants has created Nation-wide interest among agricultural colleges and experiment stations. As a result, inquiries have been received and samples of frit supplied to these institutions. Growers and fertilizer distributors have shown interest.

Figure 3 shows the greater yield of potatoes obtained with 200 pounds of frit per acre on a deficient soil, and Figure 4 shows the effectiveness of frit by growing tomatoes in sand culture, compared with a control containing soluble trace elements.

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†H. Jenny and R. Overstreet, Surface Migration of Ions and Contact Exchange, *Journal of Physical Chemistry,* volume 43, 1939, pages 1185–96.

‡F. L. Wynd et al., published in *Lloydia Quarterly Bulletin* (Lloyd Library and Museum, Cincinnati 2, Ohio), volume 14, 1951, number 1, pages 1–57.

ADVANTAGES OF AGRICULTURAL FRIT

The distinctive advantages of the agricultural frit compared to the materials now on the market may be enumerated as follows:

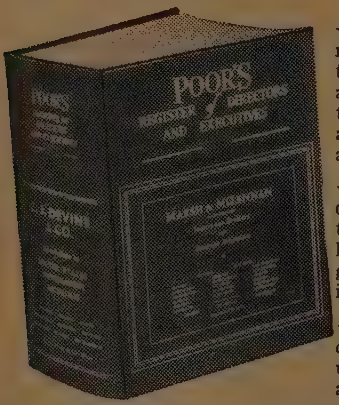
1. Frit will not wash out of the soil.
2. Frit will not tie up the soil. It remains constantly "available" to the plant.
3. Frit will remain in the soil over an extended period of time.
4. Frit's relative insolubility prevents toxic amounts of trace elements at any one time.

COSTS $4 PER ACRE

Agricultural frit costs about $4 per acre application. This is only a small part of the value of the field crops which range roughly from $50 per acre for cereal crops to $800 per acre for vegetable crops. This expenditure is indeed a cheap insurance against specific trace element deficiencies which are often almost impossible to detect. There must be a large market potential for this product, considering there are over one billion acres of farming land in this country alone. It remains to inform the people in the agricultural industry about this unique product.

Just off the Press

POOR'S 1952 Register of Directors and Executives



★ Gives 20,000 corporate listings of nationally known companies. Shows titles and duties of all leading officers and directors, technical personnel, traffic managers, sales managers, advertising managers, purchasing agents.

★ Includes complete case histories of 80,000 top-flight executives throughout the country with their home addresses, educational background, year and place of birth, interlocking connections.

★ Also includes a breakdown of 208 classifications of industry . . . a products index of over 2,500 commodity and service items.

★ All information is kept up-to-date through quarterly supplements. The first and only National Directory of Executive Personnel. Begun in 1928—revised yearly ever since. Includes a reference privilege in the largest Financial Library in the world. This 1952 edition includes over 245,000 type changes.

For FREE INSPECTION USE COUPON

STANDARD & POOR'S CORPORATION, 345 Hudson Street, New York 14, N. Y.

Gentlemen:
Please send me an examination copy of the important new 1952 Register of Directors and Executives.

NAME ....
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City .... Zone .... State A884-1327

STANDARD & POOR'S CORPORATION
345 Hudson Street, New York 14, N. Y.

SOUTHERN NATURAL GAS COMPANY
Birmingham, Alabama

Common Stock Dividend No. 52

A dividend of 62½ cents per share has been declared on the Common Stock of Southern Natural Gas Company, payable March 13, 1952 to stockholders of record at the close of business on February 29, 1952.

H. D. McHENRY,
Secretary

Dated: January 25, 1952.

* * *

ALLEGHENY LUDLUM STEEL CORPORATION
Pittsburgh, Penna.

At a meeting of the Board of Directors of the Allegheny Ludlum Steel Corporation held today, January 24, 1952, a dividend of fifty cents (50c) per share was declared on the Common Stock of the Corporation, payable March 31, 1952, to Common stockholders of record at the close of business on March 1, 1952.

The Board also declared a dividend of one dollar nine and three-eighths cents ($1.09375) per share on the $4.375 Cumulative Preferred Stock of the Corporation, payable March 15, 1952, to Preferred stockholders of record at the close of business on March 1, 1952.

S. A. McCaskey, Jr.
Secretary

The Circumstances of Petroleum

ALBERT J. McINTOSH

THE INTERESTING POINT about the forecast for 1952 is that practically all of the opinion seems to be for a slowing up in the rate of increase. This is reasonable to expect after an 8.6% increase in the use of petroleum in the United States during this past year, following a 12% increase during 1950. As can be seen from the table of figures in this article, this slow-up is pretty general and affects all of the categories of use. The details of the domestic demand follow.

GASOLINE

In gasoline, the increase looked for amounts to about 6.5%, compared to 9.7% this past year. In making these forecasts, we naturally estimate the additional cars, trucks, and buses that will be in use. We also look for a somewhat higher business activity rate in 1952 with a total physical volume some 6% above 1951. We also estimate that personal incomes may increase by 6%. These are the basic factors governing the rate of change for the major portions of gasoline consumed and would substantiate our estimated rate of change.

MISCELLANEOUS CLASSIFICATIONS

About the same rate of change is looked for in the miscellaneous classifications which include lubricating oils and greases, road oils and asphalts, liquefied petroleum gas, still gas, coke and crude oil when used as such. For distillate fuel oils we have forecast a smaller rate of change than was enjoyed this past year. In this connection we estimate that the number of central heating burners in use will increase some 10% in 1952. Diesel oil used by railroads is also forecast to have a sizable increase. These two uses account for the major portion of the estimated changes. Over 2% of this expected increase can be accounted for by savings made during 1951 because of the weather which averaged out warmer than normal and, therefore, required less consumption. The forecast, of course, is based on normal weather prevailing and would automatically call for this slight increase if nothing else changed.

TWO WILL SHOW SLIGHT INCREASE

Two other classifications of use in our opinion will show ony a slight increase. Those are for kerosene and residual fuel oil. Both our forecasts in this respect are below the average of forecasts made by others, and, because of this, an explanation of the forecasts we are making seems to be in order.

LOWER FIGURES FOR KEROSENE

Our lower figures for kerosene are predicated on a slowing up in the sales of space heaters, water heaters, and other consuming devices that use kerosene and number 1 fuel oil. A study of these sales in the last few years clearly indicates that in the northeastern states enough new stoves and heaters have not been sold to take care of the replacements of worn-out equipment. Furthermore, we believe that the additional supplies of natural gas in a large part of this area will further slow up the use of kerosene in this market. The increase in the sale of liquefied petroleum gas forecast would also tend to cause the conversion of some users of kerosene to this product. Another use of kerosene has been for jet fuel, and, according to advices we have available, it appears that this market will show a decline as more and more of the jet engines turn to the new jet fuel which calls for only a small percentage of kerosene. For these reasons we believe that the kerosene market will show only a little increase during this coming year.

RESIDUAL FUEL

As for residual fuel oil, the demand for this product is forecast quite differently from that of the other petroleum components. Studies that we have made seem to indicate that the demand tends to change as the supply changes. Refiners in normal times have continued to decrease the percentage yield of residual fuel oil, which is a natural result when a product sells for less than the crude oil from which it is made. This residual fuel oil, used largely in public utility industries, manufacturing plants, vessels, railroads, and large buildings, is subject to considerable fluctuation because many of these large utilities and manufacturing plants have standby equipment and do change the fuel they use from time to time. The supply, therefore, has a lot more to do with the use of this product than with other petroleum products. If there is a temporary oversupply, price adjustments soon make it attractive for some marginal users to switch from coal to oil, and the reverse is just as true. Therefore, we have come to the conclusion that the so-called demand for this product will fairly well approximate the supplies available over a period of time.

IMPORTS FROM CARIBBEAN AREA

One of the factors in the supply, of course, is the imports of residual fuel oil from the Caribbean area. These supplies of residual fuel oil from that area are affected by the world demand to a much greater extent than is true of other products, of which the United States imports negligible quantities. The East Coast has been dependent to a considerable extent on these imports, and, as they fluctuate, the demand or use tends to keep in step. Our forecast of imports of residual fuel oil during 1952 is naturally somewhat predicated on the situation in the Middle East where the Iranian production has been shut down for several months.

PRODUCTION OF CRUDE IN OTHER COUNTRIES

A large part of the world's loss of these Iranian products has been made up through production of crude in other countries, the opening of refinery facilities in Europe, and

U. S. Domestic Demand for Petroleum Products, Showing the Quantities Affected by Weather

Thousands of Barrels Daily

	1948	1949		1950		1951e		1952e	
	Demand	Demand	% Chg. from 1948	Demand	% Chg. from 1949	Demand	% Chg. from 1950	Demand	% Chg. from 1951
Actual Domestic Demand									
Gasoline	2,380	2,503	5.2	2,724	8.8	2,989	9.7	3,182	6.5
Kerosene, total	307	281	-8.4	322	14.6	339	5.3	343	1.2
Not affected by weather	141	128	-9.2	150	17.2	163	8.7	158	-3.1
Affected by weather	166	153	-7.8	172	12.4	176	2.3	185	5.1
Distillate, total	931	902	-3.1	1,082	20.0	1,228	13.4	1,327	8.1
Not affected by weather	445	433	-2.7	524	21.0	619	18.1	637	2.9
Affected by weather	486	469	-3.4	558	19.0	609	9.1	690	13.3
Residual, total	1,367	1,359	-0.6	1,516	11.6	1,541	1.6	1,551	0.6
Not affected by weather	1,196	1,195	-0.1	1,323	10.7	1,345	1.7	1,351	0.4
Affected by weather	171	164	-4.1	193	17.7	196	1.6	200	2.0
Lubricants, total	98	91	-7.1	106	16.4	115	8.4	121	5.2
Automotive	60	58	-3.3	65	12.1	70	7.7	73	4.3
Industrial	38	33	-13.2	41	24.2	45	9.8	48	6.7
Asphalts & road oils	159	156	-1.9	180	15.4	204	13.3	212	3.9
LPG	179	187	4.4	234	25.1	286	22.2	324	13.3
Miscellaneous	284	285	0.4	289	1.4	334	15.6	342	2.4
Crude oil	70	39	-44.3	46	17.9	21	-54.3	25	19.0
Grand Total Domestic Demand	5,775	5,803	0.4	6,499	12.0	7,057	8.6	7,427	5.2
Portion of Domestic Demand Adjusted to Normal Weather									
Weather-affected portion									
Kerosene	169	172	1.8	174	1.2	182	4.6	185	1.6
Distillates	492	525	6.7	567	8.0	640	12.9	690	7.8
Residuals	172	184	7.0	197	7.1	202	2.5	200	-1.0
LPG, incl. weather-affected	181	197	8.8	235	19.3	289	23.0	324	12.1
Subtotal	1,014	1,078	6.3	1,173	8.8	1,318	12.4	1,399	6.2
Other products, not affected	4,773	4,830	1.2	5,342	10.6	5,785	8.3	6,028	4.2
Grand Total Normal Dom. Demand	5,787	5,908	2.1	6,515	10.3	7,103	9.0	7,427	3.7
Exports									
Gasoline	103	108	4.9	67	-38.0	110	64.2	74	-32.7
Kerosene	9	7	-22.2	6	-14.3	21	250.0	17	-19.0
Distillates	58	34	-41.4	34	.....	68	100.0	55	-19.1
Residuals	36	35	-2.8	44	25.7	84	90.9	65	-22.6
Other products	54	53	-1.9	58	9.4	75	29.3	72	-4.0
Total products exports	260	237	-8.8	209	-11.8	358	71.3	283	-20.9
Crude oil	108	90	-16.7	95	5.6	77	-18.9	60	-22.1
Total Crude & Products	368	327	-11.1	304	-7.0	435	43.1	343	-21.1

e Estimate.

the expansion of refinery runs in other areas. According to our information, however, the loss of residual fuel oil supplies, formerly originating from the Abadan refinery in Iran, has not been completely made up. Therefore, it appears to us that, as long as this refinery is shut down, there will be a need to utilize more of the Caribbean heavy fuel oil for these purposes than would be so if that refinery were operating. This will therefore limit the supplies to a figure around our estimate.

5.2% INCREASE IN USE

Summarizing all of these varying trends, we look for an increase of about 5.2% in the use of petroleum and its products in the United States during 1952. This is a little bit lower than the average opinions we have seen, but even the most optimistic forecast for domestic consumption shows a smaller increase for 1952 than for 1951.

ADJUST DATA TO WEATHER CONDITIONS

In making some of these forecasts we try to adjust previous years' data to normal weather conditions. For this purpose we weight the weather in the various sections of the country according to its importance and effect on oil consumption. Some uses are affected by warm or cold weather, and some are not. In the table we show those portions of fuel oils that we believe are affected by weather and to which we apply a weather correction. During each of the last four years weather has been warmer than normal, and, therefore, actual consumption should have been less than normal. What normal consumption would have been for these weather-affected uses is shown in a separate section of the table, and percentage changes have been calculated for these which more nearly indicate true trends. We always make our calculations and forecasts from these weather-corrected data.

1951 WEATHER-ADJUSTED PORTION

In 1951 you will note that the weather-adjusted portion of distillate fuel oil (mostly home heating) is shown as 640,000 barrels a day, with an increase of 12.9% over 1950. This change is larger than we would get from a study of oil burners in use. The change of 18% for distillate consumption not affected by weather is also larger than we would think possible. Nevertheless, the Government reports indicate a domestic consumption in total up some 13%, and this in the face of fairly warm weather in 1951. This leads us to believe that something abnormal pushed these 1951 figures higher than they should be—maybe inventory accumulations—we do not quite know. So, in making our 1952 forecast, we had to discount a little of this higher-than-normal demand in 1951.

FORECASTING A REAL PROBLEM

In trying to forecast the export demand, we have a real problem on our hands. This past year's exports have been extraordinary, in that there has been supplied from the United States a great quantity of products, to make up for the loss of supplies previously originating from the Abadan refinery in Iran or from crude oil exported from that country. We would have expected a small decline in the exports from the United States during this past year based on normal trends toward greater self-sufficiency in those foreign countries previously supplied from the United States. Because of the unusual conditions, there was an increase in exports during the past year of about 43%. A great deal of this was bought for the British consumption by the Asiatic Petroleum Company which made available data on these extraordinary purchases. An examination of the figures, however, indicates some of our other exports were apparently affected by the Abadan shutdown, because the so-called normal commercial exports to various countries showed increases after a long period of rather consistent decline. Undoubtedly these unlooked-for increases all stemmed from the same change in the distribution and sources of world supplies. We do not know when the Abadan refinery will begin operating, but, for the purposes of our forecast of exports in 1952, we are making the premise that it will be around the middle of the year. These operations may not be at the rate that prevailed before the shutdown in July 1951, but we have concluded that there is a chance that these or other supplies will become available and reduce the exports to a level only slightly above the 1950 total. We have noted in forecasts prepared by other people that they believe this same result may come about primarily through an increase in refinery operations in foreign countries, exclusive of Abadan. So, one way or another, there seems to be a fairly uniform opinion that the United States will not supply for export anywhere near so large a quantity of products as it did this year.

DECREASE IN EXPORTS

This decrease in exports, of course, tends to offset some of the increase in the domestic demand forecast, and, when you combine the two, it tends to dampen the trend for this year. In our opinion this total demand will show an increase of only 3.7%, which contrasts very sharply with an increase of over 10% for 1951 and 11% for 1950. You may recall that, for both of these years, the early forecasts were for much lower rates of increase, and, of course, some of this difference cannot be blamed on the forecasters. The Korean war, which affected the 1950 and 1951 consumption to a considerable extent, both for direct military and for industrial use, could not have been foreseen. Likewise, the distortion caused by the Abadan shutdown, which increased the exports from the United States during 1951, was not predictable. Both these happenings did increase the total consumption to new and higher levels and have been a contributing factor, both directly and indirectly, to the high consumption rates experienced.

EFFECT ON PETROLEUM INDUSTRY

We have been asked recently what would be the effect of this slowing up in demand on the petroleum industry. The answer to that question seems rather clear. It would naturally follow that the refinery expansion of operations would be very modest during 1952 and the crude production to supply these refineries would increase much less than it has in the last few years. It is fairly well known that the imports of products into this country have been curtailed in recent months to make more crude and products available for the rest of the world, in order to balance out the short supplies caused by the Iranian shutdown. There is good reason to believe that, if the production in Iran and operation of that refinery comes about during this year, there will be more imports during 1952 than there were during the past year. Some of the companies, by arrangement and cooperation with Government efforts, diverted some of their crude supplies, which would have normally come into the United States, to other countries, and, as mentioned before, this was probably true of residual fuel oil. It is likely that, when conditions again become more normal in Iran, these previously established imports will be reinstated at the old higher levels and, therefore, will provide a larger supply for the domestic industry. To a minor extent, therefore, some of the increase in consumption looked for in 1952 may be made up from these anticipated imports.

OPERATED AT MAXIMUM CAPACITY

During the last year or so, refineries and crude oil production have been operated at very close to their maximum capacity. It is difficult at times to determine in either case just what the capacity really is, because, under extraordinarily tight conditions, unusual steps are taken, which seem to indicate that the capacity figures available are conservative. Our belief has been though that, when the refineries run over 95% of their rated capacity on an average, or when the crude oil fields produce close to their maximum efficient rating, in some cases at least good economics has been overlooked in order to meet temporary needs.

Most of the industry and the Government are well aware of the necessity of having re-established as soon as possible a fairly substantial extra capacity in the petroleum industry all along the line. This means there should be developed potential crude oil which will not be utilized at the moment. It means that there would be extra space in pipe lines that could be brought into use in case of an emergency, that refinery capacity will be available so that there could be a material expansion in runs if we got into a war. Just what the military demands would be in a future war and how much could be squeezed out of the civilian consumption without impairing the industrial activity of the economy are unkown. However, we know enough about these possibilities to say that, if we got into another war, we would be in a much safer position if we had well over a million barrels of crude oil that we could call on rather quickly, and if the other facilities of transportation and refining would be almost immediately available.

SLOW-UP MAY BE DISGUISED BLESSING

In view of these circumstances, a little slow-up in the increase in the use of petroleum during 1952 may be a blessing in disguise, when considered from the general overall good. The consumption today is so tremendous and the requirements for plant expansion are so great that I would think the industry would welcome a little breathing spell so that it could try to get caught up on its budget programs. The rapid increase in plant expansion and technological obsolescence which have to be overcome as rapidly as possible have had first call on a large part of the petroleum industry's earnings and have denied to the stockholders earnings that otherwise would have been their fair share.

RICHFIELD
dividend notice

The Board of Directors, at a meeting held January 26, 1952, declared a regular quarterly dividend of 75 cents per share on stock of this Corporation for the first quarter of the calendar year 1952, payable March 15, 1952, to stockholders of record as of the close of business February 15, 1952.

Cleve B. Bonner, *Secretary*

RICHFIELD
Oil Corporation

Executive Offices: 555 South Flower Street, Los Angeles 17, California

Common and Preferred
DIVIDEND NOTICE

Shreveport, La.
February 4, 1952

The Board of Directors of the Company has declared regular quarterly dividends of 25 cents per share on the common stock and $1.125 per share on the 4.5% convertible preferred stock of the company, both payable on March 1, 1952, to stockholders of record at the close of business February 8, 1952.

Secretary

TEXAS EASTERN
Transmission Corporation

Convention Schedule

San Francisco (FAIRMONT HOTEL)

SUNDAY, MAY 4:
1:00– 9:00 Registration*
6:30– 8:15 Directors' Dinner
8:15– 9:30 Annual Business Meeting of the Federation

PROGRAM

MONDAY, MAY 5:
9:00–12:15 Morning Conferences—*Railroads, Utilities and Investment Companies*
12:30– 2:15 General Luncheon
2:30– 5:30 Afternoon Conferences—*Paper and Timber and Petroleum*
5:45– 7:00 Reception
7:15– 9:45 Annual Dinner

TUESDAY, MAY 6:
9:00–12:00 Morning Conferences—*Insurance, Banking and Metals*
12:15– 2:00 Stock Market Luncheon
2:30– 5:30 Afternoon Conferences—*Chemicals, Electronics and Television*
5:45– 7:30 Reception and Entertainment—*San Francisco Stock Exchange*

FIELD TRIPS *(Tours in the San Francisco Bay Area with the following host companies):*

WEDNESDAY, MAY 7:

Contra Costa County:
Pacific Gas & Electric Co.
(includes visit to Fibreboard Products, Inc. plant in Antioch and boat trip on the Bay)

Santa Clara County:
Food Machinery & Chemical Corp.
Owen-Corning Fiberglas Corp.
International Minerals & Chemicals Corp.

THURSDAY, MAY 8:

East Bay:
Standard Oil Co. of California

Pacific Telephone & Telegraph Co.
Rheem Manufacturing Co.

Scenic Flight:
United Airlines, Inc.

Peninsula:
National Motor Bearing Co.
Permanente Cement Co.
Kaiser Aluminum & Chemical Co.

Vineyards:
Napa Valley Vintners Association

(On May 7-8 there will also be a special trip for utility analysts, with a group limit of 35, to the Caribou Lodge of Pacific Gas and Electric Co. in the High Sierras.)

Los Angeles (AMBASSADOR HOTEL)

FRIDAY, MAY 9:
9:00– 4:00 Field trips in the greater Los Angeles Area:
Douglas Aircraft Co., Lockheed Aircraft Corp., North American Aviation, Inc., Southern California Edison Co., Richfield Oil Corp., Kaiser Steel Corp., Universal Pictures Co. and others.
4:15– 6:00 Reception—*Los Angeles Stock Exchange*
6:30– 9:00 Closing Dinner—*Los Angeles Society as host*

SATURDAY, MAY 10:
Morning sight-seeing tour, visits to television and radio broadcasting studios in Hollywood.

Pacific Northwest (SPECIAL TRIP)

FRIDAY–SATURDAY, MAY 9 and 10:
Plane trip to forestry projects, paper, plywood and hydroelectric plants in Oregon and Washington as guests of: Crown Zellerbach Corp., Weyerhaeuser Timber Co., Georgia-Pacific Plywood Co., Portland General Electric Co., Pacific Power & Light Co., Mountain States Power Co.
Dinner Friday night in Portland with utility companies as hosts.

(This trip will be primarily for visiting paper and utility specialists on the basis of "first come-first served" —limited to a group of approximately 40. For information write to John R. Beckett, field trips chairman.)

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*The probable registration fee of $25 per person will include admission to all conferences, luncheons and annual dinner, and field trips in San Francisco. Registrants will also be the guests of the Los Angeles Society for the closing dinner and field trips in Southern California.

The Fifth Annual
National Federation of
SAN FRANCISCO AND
May 4 to

National Officers

President	Pierre R. Bretey
Executive Vice-President	Richard W. Lambourne
Secretary-Treasurer	Kennard Woodworth

General Chairman of the Convention	Richard W. Lambourne

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Field Trips

John R. Beckett, *Chairman*
H. Hamilton Bolton
Pierre R. Bretey
Harry G. Bruns
Joseph M. Galanis
Lancaster M. Greene
George M. Hansen
Jonathan H. Harwood
Carl R. Hauers
Samuel B. Jones
Frank X. Keaney
Richard M. Link
Paul A. Murphy
Edward M. Spencer
William C. Trapnell
Glenn M. Trumbo
James C. Wheat, Jr.

Registration

John G. Eidell, *Cochairman*
Helen Slade, *Cochairman*
George R. Berkaw, Jr.
George W. Blauvelt
Malcolm Breckenridge
Glenelg P. Caterer
Donald M. Gally
Robert H. Goff
Haworth F. Hoch
Patrick J. James
A. Moyer Kulp
T. D. Lewis
Arthur A. McLaughlin
William C. Norby
George W. Pflug-felder
E. Linwood Savage
Hollister M. Schenck
William H. Shupert
Charles Tatham, Jr.
R. Thomson
David G. Watterson
Herbert C. Wells, Jr.
Ralph C. Whitsett
William W. Wolbach

Publicity

J. C. Schick, *Chairman*
Woodward B. Norton
Ernest Ach
Berkeley M. Adams
John W. Edgerton
Walter K. Gutman
Kenneth N. Hill
T. Norris Hitchman
Lucien O. Hooper
Joseph A. Livingston
Edward W. McNelly
W. T. Moran
John C. Ratcliffe
Ralph A. Rotnem
Thomas J. Tasso
Robert J. Wilkes
William Witherspoon

Arrangements

William P. Held, *Chairman*
W. Truslow Hyde
N. Leonard Jarvis
George M. Shannon
Lawrence M. Stevens
M. Dutton Morehouse
L. Hartley Smith
T. Kenneth Haven

Convention Committees

Financial Analysts Societies

LOS ANGELES, CALIFORNIA

10, 1952

Host Society Committees

SAN FRANCISCO

Program

Philip J. Fitzgerald, *Chairman*
Richard W. Lambourne

Field Trips

John R. Beckett, *Chairman*
Kenneth C. Christensen
Robert H. Denninger
Philip A. Fisher
George L. Harding
Paul A. Pflueger, Jr.
Lewis B. Reynolds
John S. Tate

Registration

John G. Eidell, *Chairman*
Herbert B. Drake

Arrangements

William P. Held, *Chairman*
Joseph Edelstein
Arthur W. Schiefer
Adalbert Wolff
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Publicity

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Ronald C. Brindley

Finances

Paul B. Kelly, *Chairman*
John R. Beckett
Stanley Dickover
Eugene H. Gray
Douglas R. Johnston
Russell L. Kent
Richard Lawson
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Herbert Soher

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Willsie W. Wood, Bank of America, N.T. & S.A.

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Peter Avenali, Dodge & Cox
Charles D. Field, Eaton & Howard, Inc.
Sidney P. Harrison, Loomis, Sayles & Co.
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David P. Smith, Scudder, Stevens & Clark

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Ronald A. Kaehler, San Francisco Stock Exchange
Charles G. Schaeffer, Wm. R. Staats & Co.
James Shoemaker, Schwabacher & Co.
Howard Tharsing, Dean Witter & Co.

LOS ANGELES

Program

Walter Podolak

Field Trips

Richard M. Link

Registration

S. J. Thompson
George W. Pflug-felder

Publicity

Albert P. Drasdo
Ernest Ach

Arrangements

Alfred B. Post
L. Hartley Smith

Finances

Jack R. Laznick
Olaf Lighthill

Bushnell Studios

Walter Podolak

Member, Program Committee, NFFAS Convention, and President, Los Angeles Society of Security Analysts

About the Convention

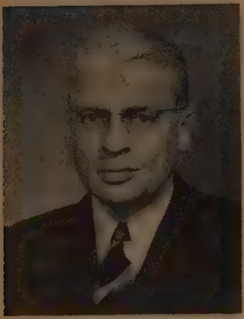
Invitation from Los Angeles

I join with the members of the Los Angeles Society of Security Analysts in inviting you to visit with us next May 9 and 10. As you know, the annual convention of the National Federation of Financial Analysts will be held in San Francisco beginning May 5, 1952. The business of the convention proper, of course, will be held May 5 through May 7, and possibly May 8, in San Francisco.

The Los Angeles Society of Security Analysts is arranging field trips, which will include the oil, movie, aircraft, television, and radio industries, for May 9 and 10. A cocktail party and dinner will be given on the evening of May 9 at the Ambassador Hotel in Los Angeles. Several nationally prominent executives of the oil and aircraft industry will be guest speakers.

Our Society will make every effort to assist visiting analysts in arranging for company meetings or other business during their stay in our city.

Walter Podolak
President, Los Angeles Society
of Security Analysts



Moulin Studios

Philip J. FitzGerald

Program Chairman, NFFAS Convention, and Security Analysts of San Francisco

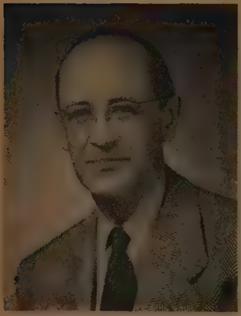
Program Notes on Federation Convention

From San Francisco we are happy to report that the tentative program published in the last issue of The Analysts Journal is well on the way to completion. When it is firm, we believe that the San Francisco Convention will provide analysts from other Societies a fine insight into operations of leading West Coast industries.

Prospective visitors to San Francisco will be glad to learn how enthusiastic our business leaders are that the Fifth Annual Convention is to be held here. They would like all to have a more comprehensive national understanding of the great business progress that has been made in the western states. We are expecting a large number of top corporate executives to attend the Convention, and we are sure that analysts from all Societies will make valuable personal contacts during their visit to San Francisco.

In addition to our busy and representative program in San Francisco, the analysts will later in the week enjoy their visit to Los Angeles. The Los Angeles Society is preparing intellectual stimulus and happy entertainment.

Cordially,
Philip J. Fitzgerald
Chairman, Program Committee
National Federation of
Financial Analysts Societies,
and Security Analysts of San Francisco



Gabriel Moulin Studios

William P. Held

Arrangements Chairman, NFFAS Convention, and President, Security Analysts of San Francisco

Hotel Reservations for the 1952 Convention

To avoid the "last minute rush"—and to insure the accommodations you prefer—may I urge you to obtain your hotel reservations in San Francisco and Los Angeles as soon as possible?

The Convention committee has arranged for a reasonable number of bedrooms and suites at the following:

In San Francisco

Fairmont Hotel (Headquarters), 950 Mason Street
Mark Hopkins Hotel, 999 California Street
Huntington Hotel, 1075 California Street
St. Francis Hotel, Powell at Geary Street

In Los Angeles

Ambassador Hotel (Headquarters), 3400 Wilshire Boulevard

The Fairmont, Mark Hopkins, and Huntington in San Francisco are close together atop Nob Hill. The St. Francis, in the heart of the shopping district, is only a few blocks away and on the cable car line.

The Ambassador Hotel in Los Angeles has been selected from the viewpoint of convenience to shopping areas and accessibility for field trips.

The Convention dates:

In San Francisco—May 4 through May 8
In Los Angeles—May 9 and 10

Since the demand for accommodations by attending analysts and guests may exceed the number of rooms we have set aside, we strongly recommend that you write direct for your reservation—and without delay—to one of the designated hotels in San Francisco and the Ambassador in Los Angeles. We know you will want to be located in the center of Convention activities. If you wish further assistance or advice regarding hotel reservations in San Francisco, please write to Helen Slade, 400 East 57 Street, New York 22. For other information on Los Angeles hotel arrangements, write Walter Podolak, 325 West 8 Street, Los Angeles. COME WEST IN 1952!

Cordially,
William P. Held
Chairman, Arrangements Committee
1952 National Convention

Progress Report on Special Train

The National Federation Convention

See industry at work . . . West Coast companies on display . . . Railroad tour to Convention from Chicago to San Francisco—return via Los Angeles, Houston, and New Orleans.

LAST DECEMBER I WROTE you about the National Federation Convention that is to be held in San Francisco in the week commencing May 4. At that time, I mentioned some of the field trips to be available when you are on the West Coast. I also gave a rough outline of the rolling industrial tour that Pierre Bretey, our President and railroad expert, planned. You will recall at that time that I stated we had to have a minimum of 150 reservations for the trip by special train. The initial response to the trip has been tremendous. We have already received "indications of interest" from 175 people. There are 50 applicants from Boston. This includes 20 wives of members. All have tentatively signed up for the full tour. Philadelphia has enrolled 26, including 8 wives of analysts.

READY TO ACCEPT RESERVATIONS

In view of the enthusiastic interest shown, Pierre has proceeded with the plans. We are now ready to accept reservations for the trip. Reservations will be filled in order of application. Inasmuch as 175 people have already indicated interest, we are certain that a full complement will be reached very shortly. In order to insure a place on the trip, it is recommended that you send for your reservation right now.

PARTICULAR POINTS OF INTEREST

I am not going to describe any of the Convention activities in this letter. You will hear directly from Dick Lambourne and his committee in San Francisco all about the wonderful program that they have arranged. I am going to highlight some of the particular points of interest of the train trip and tell you about the itinerary that has been worked out. I shall describe some of the field trips on the West Coast that will be available to all of those attending the Convention in San Francisco.

Pierre has been working hard with his railroad friends, ironing out some of the scheduling and routing problems and also working on the very important problem of costs. I know a number of you have been waiting for this final figure before reaching a decision. Pierre has been able to arrive at the final figure and has also given me further details of the trip; so you can now consult with your partners, senior officers, associates, wife, and bank balance before you commit yourself for this once-in-a-lifetime opportunity to visit industry at work, meet the officials that run these large enterprises, and enjoy the panorama of the whole country, all in less than three weeks. Let me also remind you again that such expenses come out of gross and not net. For many, because of the benefits obtained, these expenses are deductible for tax purposes.

I hardly need mention the sociability angle or the chance that you will have during these two and a half weeks to promote friendships and exchange information with other analysts and investment specialists.

TRAIN TRIP SUITED TO ALL TASTES

The special train will take our party from Chicago to the Convention in San Francisco. After four days of meetings and field trips in the San Francisco area, we shall return via the Southern route, visiting for two and a half days in Los Angeles, and proceed through El Paso, Houston, and New Orleans, and up the Mississippi Valley to Chicago. We have planned many stops along the route.

LADIES OFFERED ALTERNATE TRIPS

At most of the places to be visited, both on the West Coast and on the train tour, analysts and the ladies will be offered several alternate trips. There is to be no regimentation. Those of you making reservations for the train will be sent, at a later date, a detailed blank on which you can express your preferences for the tours and inspection trips that are being offered. We in turn will then be able to communicate directly with each company and work out the final schedules and details covering transportation, guides, and all of the myriad details that go into conducting a successful tour. Similarly, choices for West Coast field trips will be presented to everyone registering for the Convention. Obviously, it will be impossible for each person to visit every place and company mentioned.

BELT LINE TOURS

Rail analysts will go on Belt Line tours and see the sources of traffic. Railroad officials will accompany us on the train tour to answer technical questions and supply traffic information. Utility analysts will have a chance to concentrate on power stations, territory growth, and regulatory atmosphere. Industrial followers will have to choose their favorite industries. They will have to make a choice, for instance, between seeing United Air Lines maintenance base and the Standard Oil of California Richmond plant. Those that decide to visit Crown-Zellerbach and Weyerhauser in the Northwest will probably not have time to see the aircraft manufacturing companies in the Los Angeles area.

At every stop, company executives are to be present to welcome the group and answer questions. In many cases, they will be our hosts at luncheons and dinners. As I see it, you can select your field trips from one of three categories.

The *passive* group will sit in the club car of the special train and play cards or watch the country go by. The *middle-of-the-road* group will go on all the motor sightseeing trips and side excursions. They will concentrate on atmosphere and natural scenery. They will see Denver's Mountain Park System, the famous Mormon churches in Salt Lake City, Feather River Canyon, Monterey Peninsula, Carmel Mission, New Orleans and its famous French Quarter, Wilshire Boulevard, Juarez, the Texas Plains, and fabulous Houston. The *active* group is especially designed for the "eager beavers." They should bring their biggest notebooks to record their impressions of rails, utilities, and company managements. They will see and learn about the growth of the West Coast and the fabulous Gulf Gold Coast. They will have a chance to see what a petrochemicals plant really looks like. They will see a $100 million chemical plant being expanded. They will see cat crackers and the kind of Christmas tree that grows in the oil country.

How many times have you spoken or written learnedly about the aircraft industry or fiber glass or aluminum or the growth of the petrochemical industry along the Gulf Coast, or the hydro developments of Pacific Gas & Electric, and wished that you had a "feel" or background that can only be achieved through seeing the plants and meeting the officials that manage them. Here is that opportunity.

TRAVEL ITINERARY

You will recall that in my story on the Convention that appeared in the Fourth Quarter edition of The Analysts Journal I mentioned a number of the companies that Pierre thought we should be able to visit. I am not going to repeat the list. The itinerary giving the dates and the areas to be covered has been worked out. I have extracted from the itinerary a few days which will serve as typical examples of the field trips that have been arranged.

April 30	Chicago
May 1	Denver
May 2	Provo and Salt Lake City, Utah
May 3	Portola, California, Feather River Canyon
May 4	San Jose, Santa Clara Valley, Monterey
May 5	Convention at San Francisco
May 6	Convention at San Francisco
May 7	San Francisco Bay Area Field Trips
May 8	San Francisco Bay Area Field Trips
May 9*	Los Angeles Field Trips
May 10*	Los Angeles Field Trips
May 11	Los Angeles (leave in early forenoon)
May 12	El Paso
May 13	Houston
May 14	Houston
May 15	New Orleans
May 16	New Orleans
May 17†	New Orleans or Natchez, Mississippi
May 18†	Chicago

*Alternative field trips to Northwest.

†Special arrangements can be made on application for those wishing to stay an extra day in New Orleans and then proceed directly to Eastern cities.

The analysts converge on Chicago on the morning of Wednesday, April 30. For those that arrive early in the day, there will be an opportunity to go on a very interesting tour over the Chicago & Western Indiana and Belt Line Railroads, winding up in Clearing Yard for a luncheon. The grand tour will officially get under way on a special train on the Burlington Railroad at 4 o'clock in the afternoon. Half a day will be spent in Denver seeing officials of both the D. & R. G. and of the Public Service of Colorado. The train moves over the Denver & Rio Grande in the evening.

TYPICAL DAY ON ROUTE

On May 2, the special train will arrive at Provo, Utah, at 9 A.M. There Utah Power & Light Company will be our host. Several alternate trips are offered, including visits to (1) the U. S. Steel plant at Geneva, occupying 1,500 acres devoted to producing 1,500,000 ingot tons of steel, and including blast furnaces, open hearths, Bessemers, and sheet mills; (2) the Kennecott open-pit mine at Bingham, largest in the world, and the new $16 million electrotype copper refinery; and (3) the Hale and Gadsby generating plants of our host.

FAMOUS MORMON CHURCHES

Those ladies who wish to forego visits to industrial plants will not detrain at Provo, but proceed to Salt Lake City, where they will enjoy a special tour of the city and environs, including the famous Mormon churches.

The reunited party will reassemble at the Hotel Utah, where dinner will be served. The train will leave Salt Lake at 9:00 P.M.

LUMBER PROPERTIES AND POWER STATIONS

On May 3 the group will inspect lumber properties high in the Sierras and visit Pacific Gas & Electric power stations and then come down the spectacular Feather River Canyon. On Sunday, May 4, the rolling tour will proceed leisurely through the scenic Santa Clara Valley, bringing the travelers to San Francisco by evening. (Directors will arrive in San Francisco in time for their meeting.)

FIELD TRIPS IN SAN FRANCISCO

The field trip committee in San Francisco, John R. Beckett acting as chairman, has arranged for a galaxy of West Coast corporations to open their plant facilities. These cover the major industries on the Coast! Just listen to a few of the field trips, and then see that you cannot afford to miss this opportunity.

On Wednesday, May 7, two trips will be offered. One group will be the guests of the Pacific Gas & Electric Company on a tour by buses starting in San Francisco, proceeding across the bridges to the East Bay and on up to the huge steam power plant of Pacific Gas & Electric at Antioch in Contra Costa County. After seeing the electric properties, the group will inspect the new pulp and paperboard mills of Fiberboard Products, in Antioch, and then will be taken on board a launch, where luncheon will be served. The rest of the afternoon will be spent on the boat coming down through the straits and into San Francisco Bay. The trip will provide a view of the industrial development of the region, as well as of the superb scenery in the harbor of the Golden Gate. Cocktails and a late afternoon buffet on the boat will complete the tour.

The second group on Wednesday, May 7, will be the guests of Food Machinery & Chemical Corporation in association with International Minerals & Chemical Corporation and Owens-Corning Fiberglas Corporation, for a trip down the peninsula by bus to beautiful Santa Clara County. The group will go through the new Fiberglas plant of Owens-Corning in the morning and then visit several of the chemical and manufacturing plants of Food Machinery, including the amphibian tank-producing facilities. Luncheon will be held at the San Jose Country Club, where there will be a special meeting with executives of the companies. In the afternoon, the group will visit the new plant of International Minerals where amino chemicals and food additives are being made, after which the buses will return to San Francisco via a scenic route up the peninsula.

The field trip schedule in the San Francisco Bay area for Thursday, May 8, will be made up in smaller groups to appeal to the diverse interests of visiting analysts. These have been planned with the following hosts:

1. *Standard Oil Company of California.* Bus trip to the Richmond oil refining and petrochemical plants of the company in the East Bay. The tour will include a meeting with top officials and a visit to the California Research Laboratories, with a special talk on petrochemical developments. A barbecue luncheon will be given at the Rod and Gun Club.

2. *Napa Valley Vintners Association.* Via buses through Marin and Sonoma Counties north of the Golden Gate into the heart of the wine-producing country of Northern California, where participants will go through several of the famous old wineries and vineyards and be entertained at luncheon as guests of the Vintners Association. This area is recognized as one of the most beautiful nature spots of the country, including such locations as the Valley of the Moon, made famous in the writings of Jack London and Robert Louis Stevenson.

3. *National Motor Bearing Company and Kaiser Industries.* By bus down the peninsula to the manufacturing plant of National Motor Bearing in San Mateo County, to be followed by luncheon and afternoon trip to the Permanente Cement Company plant and the aluminum foil plant of Kaiser Aluminum and Chemical Corporation, located in the Los Altos hills of Santa Clara County.

4. *Pacific Telephone & Telegraph Company and Rheem Manufacturing Company.* Bus trip to the microwave and international radiotelephone facilities of Pacific Telephone on Mount Diablo beyond the Berkeley Hills, where participants will have an outstanding panoramic view of the area. Luncheon will be served at the Diablo Country Club, after which the group will go through the extensive metal container plants of Rheem Manufacturing in the East Bay.

5. *United Air Lines.* Via bus to the San Francisco Airport for a tour of the modern maintenance and repair facilities of the company, followed by a special plane flight circling over the entire Bay area as well as parts of North Central California.

SPECIAL TRIPS

Two special trips of particular interest are to be offered. Each of these trips is to be limited in size. The Pacific Gas & Electric Company will have a two-day trip (limited to a group of 35), going first through the Sacramento Valley agricultural areas and thence up to their Caribou Lodge in the high Sierras. Here utility analysts will see some of the most spectacular hydroelectric facilities on the continent, as well as the grandeur of the Sierra Range.

The other special tour (also limited in size) will visit pulp, paper, plywood, and hydroelectric utility companies in the Northwest on May 9 and May 10. Traveling by chartered plane, the group will visit the tree farms and forestry projects of Crown-Zellerbach; the plywood plants of Georgia Pacific Plywood Company; and the lumber mills and pulp mills of Weyerhauser Timber Company. The visitors will be guests of the utility companies at a dinner in Portland, where utility managements will review the prospects of the electric utility industry of Pacific Northwest.

FIELD TRIPS IN LOS ANGELES

Arrangements are now being worked out by the Los Angeles committee. With a wealth of major industries to draw upon, Los Angeles is prepared to offer a variety of trips and entertainment. Visitors will have an opportunity to choose between trips to the aircraft manufacturing companies, the local utility companies, and the motion picture industry in Hollywood. A tour of the television and radio-broadcasting studios is planned. Douglas Aircraft, Paramount Pictures, and Richfield Oil should all be subjects of compelling interest.

FIELD TRIPS IN HOUSTON

Typical of the field trips in Houston will be the visit to the Dow plant at Freeport, 80 miles southeast of Houston on the shore of the Gulf of Mexico. Here you will see the largest magnesium plant in the country utilizing sea water as a primary raw material in the production of critical magnesium. Also to be visited will be the plants of Dow Ethyl Corporation and Stauffer Chemical. You will drive through rich oil- and gas-producing territory and see the famous Hoskins Mound of Texas Gulf Sulphur. The next day you will be the guests of the Chamber of Commerce on their launch down the ship canal, viewing many heavy industries, and stopping at the San Jacinto Battle Monument, later visiting the Humble Oil Refinery at Baytown as guests of management. Other industries will be viewed returning to Houston.

FIELD TRIPS AT NEW ORLEANS

The New Orleans Belt Railroad, the Illinois Central Railroad, and the Board of Port Commissioners will collaborate on a trip over the entire facilities of the Belt Line Railroad, including plants, docks, and the famous Huey P. Long Bridge. The Port Commissioners will provide their launch for a trip of the harbor installations. Kaiser Aluminum and Chemical Company management will entertain us at the new Chalmette Plant on the outskirts of New Orleans. This plant has just commenced operations and is in process of expansion to the largest aluminum plant in the country. We will also visit the Celotex roofing plants as guests of the management. Middle South utilities and Gulf States utilities are waiting to guide the visitors through both rich Louisiana farming areas and through new oil and gas fields.

ANTE-BELLUM HOMES

After two days at New Orleans the special train will proceed over the Illinois Central to Natchez, Miss. Industrial plants of Armstrong Rubber, Johns Manville, and International Paper will be visited. The ladies will visit the gardens and the stately ante-bellum homes, famed in history and fiction. The train will then return directly to Chicago. Arrival is scheduled for Sunday morning, leaving ample time to catch eastbound trains.

For those wishing to spend an extra day in New Orleans, a direct routing from New Orleans via "The Crescent" to eastern cities will be available.

SPECIAL ENTERTAINMENT FOR THE LADIES

Special sightseeing tours and trips—new sights—interesting companions—no children—no meals to prepare or dishes to wash. The response shows that wives must see something pretty special and interesting in this trip.

PRICES

Pierre and his railroad friends have done a wonderful job in keeping the costs at a low level. Below is given the table showing the costs from different cities for different types of accommodations. I want to call your attention particularly to the fact that the price given includes all necessary living and traveling expenses except for meals at New Orleans and the expenses that you will incur in San Francisco and Los Angeles. Remember that the convention registration fee will cover the cost of field trips in those two cities, and we anticipate that our West Coast hosts are not going to permit us to reach for many meal checks during our stay in California.

	Per Person			
From City of Origin to Point of Return	*Roomette*	*2 in Comp., Each*	*2 in Draw., Each*	*3 in Draw., Each*
Chicago	$455	$465	$490	$455
New York	595	595	630	580
Boston	600	600	635	585
Philadelphia	570	570	610	560
Washington-Baltimore	565	565	605	555
Detroit	495	495	525	490
Cleveland	515	515	550	505

The rates in the table include:

1. Round-trip rail ticket, including Pullman space as selected.
2. All meals en route except in San Francisco, Los Angeles, and New Orleans.
3. Transfer of baggage and passengers wherever required.
4. Hotel accommodations in Houston and in New Orleans.
5. Cost of all field trips except in Los Angeles and San Francisco.
6. Sightseeing trips for ladies as designated.
7. Tips.

Cost of the trip will depend on the accommodations selected. Full data are given in the schedule.

On Tuesday, April 29, the Boston contingent will leave at 2 P.M. daylight saving time on the New England States Limited, the New York contingent on the Twentieth Century Limited at 6 P.M. DST, and the Philadelphia contingent from North Philadelphia on the Broadway Limited at 7:20 P.M. DST.

INFORMATION AND SPECIAL NOTES

Make out your check for the correct amount to the Burlington Lines. Send your check to the Chicago, Burlington & Quincy Railroad, 500 Fifth Avenue, New York 18, N. Y., marking it *National Federation Trip, Attention Mr. Robert S. Caird, Assistant General Passenger Agent.*

The following information must be supplied along with your check:

1. Your name.
2. Your address.
3. Name of your wife (if she is going).
4. City of origination and termination.
5. Accommodations requested.

Please send a duplicate copy of this information to me, care of Eaton & Howard Incorporated, 24 Federal Street, Boston.

Reservations will be made in the order of application. To insure securing a place, we recommend sending in your check and application promptly. In the event that you find it necessary to cancel your application some time *before* the 25th of April, refunds will be made.

Special rates will be made for analysts wishing to come from San Francisco or Los Angeles to Chicago only. Application should be made directly to Pierre Bretey.

Meals. Each railroad will do its best to provide fine meals consonant with the character of our group.

Travel representatives of the railroad will accompany the trip to take care of travel details.

Those going on the trip should immediately make their own hotel reservations in San Francisco and Los Angeles, or, should they desire, make such request to Helen Slade, 400 East 57th Street, New York 22, N. Y. The suggested hotels in San Francisco are the Fairmont, the Mark Hopkins, the Huntington, and the St. Francis; in Los Angeles, the Ambassador. Make your reservations in San Francisco for May 4 through May 7, and in Los Angeles May 9 and May 10.

Kennard Woodworth

Secretary-Treasurer
National Federation of Financial Analysts Societies

Book Reviews

In this department are summarized books, articles, and documents of outstanding economic or financial interest. A list of articles, which may be useful to the security analyst, follows the reviews.

Helen Slade is the author of the books reviews. She will co-operate with members of the Society desiring source material for JOURNAL *articles and for research projects and studies.*

Security Analysis

Benjamin Graham and David L. Dodd,
with the collaboration of
Charles Tatham, Jr.

McGraw-Hill, 770 pp

That this issue of Benjamin Graham's study of security analysis is dedicated to "The New Generation of Security Analysts" goes far to show that it has been completely revised and rewritten with an entirely fresh approach. Both Mr. Graham and Mr. Dodd have spent years putting forth this completed work.

Past editions have been a directing influence for correct appraisals of values. This final volume is destined to be the source of techniques for wide and intelligent corporate examinations, by which correct measurements of market value of shares may be made. Not only the young but also the more seasoned men will find much by which to add to their skills. In the utility section where additions have been made by Charles Tatham, Jr., experts may seek—and find useful data.

An informative portrayal of valuation lies in the concept of assets and their relation to market prices. The asset worth of common shares is often difficult to appraise, and "the typical outside stockholder of a listed company has no practical access to his share of net assets." Assets and their relationship to other items and factors are clarified.

Basic approaches to investments differ, notably on account of one's own desires. Some look for and wish short-term gains; others seek "growth shares" with final profits in the distant future. Many like the authors themselves seek diversification at, as is stated in the book, "reasonable levels."

Just how to discover what is desirable to own is simplified by perception of accounting methods. Part II gives details concerning the "Analysis of Financial Statements." This is done in so interesting a manner that one almost fears some may think the subject may be easily learned. Yet here too are sections to challenge the wisest. Valuations of inventories and inventory reserves should take some rereading. The paragraphs on "LIFO," the assumptions of impingements from original costs, and methods of "applying" the "LIFO" concept ought to be the objects of hours of thought.

Stockholder relationship, which was no problem in 1934, now emerges as one of deep significance. Today's holders of stocks have become the conscious owners. They are aware of management and what it is required to do. The wisest manner in which shareholders can do their part is to "act as intelligent owners" and consider what best serves the company's needs.

This is a book to be studied—a bit at a time; and gradually understanding all it has to teach will prove a profitable occupation.

Taxation and the American Economy

William H. Anderson

Prentice Hall, 598 pp, $8

The author is correct in stating there has arisen a need for a book on taxation. And this all-inclusive story of the taxes that have become heavy on the American citizen leaves the reader with a comprehensive conception of what they are and what they may be. It may frighten some. In 1890 total Government expenditure came to $850 million. Now, after some gyrations, they are again reaching their high and are "tending toward $100 billion." Expenditures set by Government outlays might become overpowering.

Constitutional curbs on taxation are explained in a chapter called "Constitutional Foundations," which tells of constitutional limitations and principles. In another chapter, detail is given about sources of revenue, apportionment of revenues, and how to achieve patterns of distribution of the tax burden. The theory of "ability to pay" is brought to the reader's attention. One of the most important of tax procedures is good administration.

The first income tax came in 1861 as a war measure and was abolished in 1872. Another passed Congress in 1894 and again was declared unconstitutional. In 1919 it was voted to tax corporations, and in 1913 had come the 16th Amendment giving Congress the "power to lay and collect taxes on income." This source of Government income worked well in World War I.

Since we have taxes, procedures of paying are important. Problems and the manner in which income tax accounting works, including exclusions and allowances, make illuminating reading. Facts dealing with the taxation of securities, special businesses, and airplanes are included in another chapter.

The relevance of a tax policy to private enterprise and how it affects American business and economic life are explored. And it has been found that there is little doubt that incentives to productive work are influenced by taxation. There should be, the author concludes, "avoidance of high marginal rates on personally created income" plus allowance of an earned income credit. Our present income tax discriminates against the gains, usually irregular of risk investments. Against this tax-induced loss are several proposals that might relieve the burden. There must be "avoidance of high marginal rates on personally created income," which is destructive to the supply of capital.

For people who delight in tax problems this book is a boon; for all others it explains much they should know. The lists of "Sources of Tax Information" are in themselves more than an added reason for owning this book.

FINANCING FOR DEFENSE

Albert G. Hart and E. Cary Brown

Twentieth Century Fund, 161 pp, $2

This timely study presents all programs for spending by the Government as well as how funds should be raised. The author thinks that the public does not as yet realize the impossibility of proceeding without higher taxes. For those who do not, there may be a painful awakening.

Budget measures to finance defense, and at the same time avoid serious inflation, are examined and considered in the light of how much impact they may have on the economy. Since our need for increased revenue will continue for some time, so will taxes. Just which or how much is the question. The personal income tax may be useful, especially if the base can be made broader.

Present corporate taxes include taxes on income and on excess profits with stress on the "normal income." Just what is meant by "normal" may be controversial. There seems to be little doubt that the best tax is one that leaves the corporation with spendable funds; otherwise it would encroach too drastically on investment in plant and equipment.

To prevent further inflation, we have the use of controls, but the interlude in inflation when the study went to press in June 1951 is not what may be expected with certainty in the future. "For the future, the dominant fact is the large increasing column of military supplies going into production. This will require heavy governmental outlays and heavy diversion of supplies from civilian uses." Although real inflationary danger faces us, it is not of the explosive type that carry prices skyward. Our economy, its structure and manner of functioning, prevents extreme inflation. But it can be enough to "wipe out a large part of fixed incomes and insurance, annuities, and all other forms of savings." Inflation control cannot be our sole concern. We must build production and keep up work incentives. For this reason price controls are not advisable.

It is recommended to re-examine programs and to impose economies, while "aiming at a $16 billion increase in revenue."

STEEL SERVES THE NATION

The Fifty Year Story of the
United States Steel

It is hardly an exaggeration to say that nothing comparable to this report has been done. Both by word and picture, the history of the U. S. Steel Corporation and information about its subsidiaries are presented. This report deserves special mention. Not only is it a full record of the corporation's contribution to American industry, but its beauty and elegance are unusual as well.

The U. S. Steel Corporation has provided steel for all sorts of requirements and stands not only as a great manufacturing company but also as an example for industry.

The report shows of the services to shareholders, workers, special funds, and pensions, each a story in itself. It is elegantly printed and beautifully illustrated.

THE INVESTMENT COMPANY AND THE INVESTOR

Rudolph Weissman

Harper & Brothers, 217 pp, $3.50

Since the investment company is becoming increasingly popular with the public, a book describing its operations and the opportunities it offers is welcome. For that reason this book will be useful to most persons.

A table showing individual trust records, covering, among other items, their values and market price, deserves attention. In fact all the tables are worth seeing. One showing the stocks most widely held by investment trusts may be surprising to some investors.

That the trusts diversify holdings of small investors is illustrated, how they function and what they do is well explained. Now that personal trusts, as well, have reached a sizable number, the future of these funds becomes of importance to the public. They may be called "a new force in the capital markets." In the long run, the author finds they will be an ever-increasing means of investment, and, as the years pass, a more and more dominant force in the market. The book brings much information and certainly describes the mechanism of the investment company and the investors' chances of success when buying these shares.

NIEFELD'S GUIDE TO INSTALLMENT COMPUTATION

M. R. Niefeld

Mack Publishing Co., 410 pp

This "guide to installment payment computations" will simplify the tasks of investment dealers, finance companies, and others engaged in monetary calculations. Some difficult formulas are explained and made easy to understand. For persons who unravel statements and visit working corporations, there will be helpful methods of a novel structure to be found in this book. They are simply set forth. Although there are few intricate presentations, the scope is all embracing, and there are methods of mathematical techniques which are useful to know.

Consumer credit departments of banks will find this study useful, especially for the kind of accounting dealing with this subject. A complete technical vocabulary is included.

CORPORATE INCOME RETENTION, 1915–43

Sergei P. Dobrovolsky

National Bureau of Economic
Research, 122 pp, $2.50

This fine little book gives information on corporate income retention policies and on how closely income retention is associated with corporate profitability. Table 1, showing the proportion of net income retained by manufacturing corporations, is of particular interest and indicates that net income retention came after about 5% of "net worth had been attained." Both large and small corporations have a tendency to increase the use of both external and internal funds with the expansion of their assets. Most important of the findings is that all corporations draw heavily on capital markets when their expansion is rapid. Just what degree of change affects income retention is indicated by the unusually complete and instructive tables.

Recent Books, Documents, and Magazine Articles of Financial Interest

Monetary & Fiscal Subjects

The Federal Reserve and The Treasury, *Harvard Business Review*, Nov 1951.

Financing and Factoring Accounts Receivable, *Harvard Business Review*, Jan 1952.

Money Rates in Britain, *Banking*, Feb 1952.

Is there an Inflation Bugaboo?, *Commercial & Financial Chronicle*, Jan 3, 1952.

American Trading in Foreign Securities, *Journal of Finance*, Dec 1951.

Accounting Education, *Certified Public Accountant*, Jan 1952.

Managers of the Dollar, *Fortune*, Feb 1952.

Interest and Public Expenditure Financed by the Central Bank, *Review of Economic Statistics*, Nov 1951.

Can Life Insurance Hedge Against Inflation?, *Banker*, Dec 1951.

Restricted Stock Option Plan, National Industrial Conference Board, Dec 1951.

Gold in the Post-War World, *Midland Bank Review*, Nov 1951.

Auditing, *Account*, Oct 1951.

International Monetary Fund, Schedule of Par Values, Aug 1951.

Canadian Co-ops and Credit Unions, *Canadian Forum*, Nov 1951.

Population Movements and Investments, *Journal of Finance*, Dec 1951.

Economic & Miscellaneous

The Business Outlook, 1952, The Conference Board.

Report on American Industry, *Forbes*, Jan 1, 1952.

How to Export Coal, *Economist*, Jan 12, 1952.

Population: Prospects and Problems in 1960, *Dun's Review*, Jan 1952.

Utilization of Older Manpower, *Harvard Review of Business*, Nov 1951.

Industrial Retirement Plans: a Study, Bankers Trust Company, New York.

Social Contribution by the Aging, *Annals*, Jan 1952.

Population Movements and Investments, *Journal of Finance*, Dec 1951.

Manufacturers' Problems under Price Controls, *Harvard Review of Business*, Jan 1952.

Economic Almanac, 1951–52, National Industrial Conference Board.

Food and the Present World Tensions, *Journal of Home Economics*, Nov 1951.

Allocations: Blueprints for Food Distribution, *Annals American Academy*, Nov 1951.

Rank in Population, Retail Sales, Income, in All Cities with Sales $20 Million and Over, *Sales Management*, Nov 10, 1951.

Measures for the Economic Development of Underdeveloped Countries, *International Labour Review*, Nov–Dec 1951.

Agricultural Assistance through Capital Investment, *U. S. Dept State Record*, Nov 1951.

Western Europe: an Economic Review, 1951, National Association of Manufacturers, Serial 45.

The Inventor, Vanishing America, *Forbes*, Dec 15, 1951.

Productivity, Key to Prosperity and Peace, *Commercial & Financial Chronicle*, Dec 3, 1951.

Utilities Feel Impact of Taxes, report of the Public Service Securities Committee at Investment Bankers Association, Nov 25-30, 1951.

Why Republicans Worry, *U. S. News*, Dec 28, 1951.

Wages and Salaries in '52, *Conference Board Management Record*, 13, Dec 1951.

Atomic Energy Legislation of the 80th Congress, publication 10 Mar 1951.

Summary of Legislative Record of the 82d Congress, 1 Sess, Senate Document 85.

The Pacific Pact, *World Affairs*, Nov 1951.

Controls Won't Stop Inflation, *Freeman*, Nov 19, 1951.

How Necessary Are Cartels?, *Current History*, Dec 1951.

Industrial

Airline and Aircraft Manufacturing, report at Investment Bankers Association, Nov 29, 1951.

Aluminum for Defense, Public Affairs Institute, 1951.

The Production Story (Distilled Spirits), *Spirits*, Dec 1951.

Postwar Flour Mill Construction, *Northwestern Miller*, Dec 11, 1951.

Grocery Manufacturers of America, *Northwestern Miller*, Dec 18, 1951.

Realtors Lash out at Government Spending, *National Real Estate and Building Journal*, Dec 1951.

Railroads and the ICC, report of the Railroad Securities Committee at the Investment Bankers Association, Nov 25-30, 1951.

Handbook on Major Regional Farm Supply Purchasing Cooperatives, U. S. Dept of Agricultural, May 1951, miscellaneous report 150.

The Wheat and Flour Market in Peru, *Northwestern Miller*, Nov 20, 1951.

Retail Trade: Area Statistics, Supt of Documents, 1951, $7.50.

Balancing America's Metal Requirements, *Harvard Business Review*, Nov 1951.

Financial Control and Administration of Municipal Enterprises, *Municipal Finance*, Nov 1951.

Dealers (Building Materials) Fight to Keep Sales Volume Up, *American Lumberman*, Nov 3, 1951.

Taxes

Costs and Tax Blow to Profit Put Management to the Test, *Credit and Financial Management*, Jan 1952.

The Farmers' Tax Burden, *National Tax Journal*, Dec 1951.

The Purchase Tax and Fiscal Policy, *National Tax Journal*, Dec 1951.

Taxation of Intangible Personal Property in Ohio, University of Wisconsin Publication.

A Report (Tax) How Much Can Our Economy Stand?, Chamber of Commerce of the United States.

Enforcing State Consumption Taxes on Out-of-Town Purchases, *Harvard Law Review*, Dec 1951.

Taxation Conference—Great Britain, *Accountant*, Nov 3, 1951.

History and Administration of the State Tax System, N. Y. State Dept of Taxation and Finance, Research and Statistics Bureau, Aug 1951.

Reports of Affiliated Societies

Richmond Society of Financial Analysts

A MOST WELCOME ADDITION to the National Federation of Financial Analysts is the Richmond Society. It is with great pleasure that we welcome them, knowing full well that they will be a great asset to the organization. We are happy to have them join us.

The officers of the Richmond Society are:

President: Hollister C. Schenck, Life Insurance Company of Virginia
Vice-president: James C. Wheat, Jr., J. C. Wheat & Company
Secretary-treasurer: Berkeley M. Adams, State-Planters Bank & Trust Co.

Financial Analysts of Philadelphia

THE YEAR 1951 has been one of continued growth and activity for the Financial Analysts of Philadelphia.

During the past year 21 luncheon meetings and 3 dinner meetings were held. A list of the speakers and their subjects accompanies this article. Last January 25, 1951, we were the guests of the Atlantic Refining Company on an all-day program which included inspection of their plants, followed by luncheon and reports of the company by several of its officers. About 90 Philadelphia members attended, being joined by approximately 95 out-of-town members of the National Federation from New York, Boston, Providence, and other cities. Our members were also active in attending out-of-town functions such as the Annual Convention of the National Federation of Financial Analysts Societies in New York on March 7, 1951; the Regional Meeting and Research Row Tour sponsored by the Boston Security Analysts Society on June 5 to 6, 1951, and the Eastern Regional Conference sponsored by the New York Society of Security Analysts in New York on November 8, 1951. It is hoped that many members will find it possible to attend the National Federation Convention when it meets in San Francisco in May 1952.

Our membership continued to grow during the past year. As of December 13, 1951, we had 229 members on our active list, compared to 195 the previous year, a net increase of 34, or 17%. Forty-seven new members were accepted, 5 were lost through resignation or death, and 8 were temporarily lost through recall to service with the United States Armed Forces. Classified by affiliation, our active membership is currently being drawn from commercial and savings banks 23.0%, industry 6.9%, insurance companies 9.6%, investment banking firms 40.9%, and miscellaneous affiliations 19.6%.

The annual meeting was held December 13, 1951. The secretary gave a report on the activity and growth of the Society, and the treasurer reported on the Society's financial condition.

Samuel B. Jones, chairman of the nominating committee, presented a list of candidates as officers for the year 1952 and directors to serve to December 1954. Since there were no nominations from the floor, these names were unanimously approved:

President: Robert J. Ogilvie, Wellington Fund
Vice-president: Robert Coltman, Provident Trust Company
Secretary: Everett Richard, Home Life Insurance Company of America
Treasurer: Thomas P. Stovell, Tradesmens National Bank and Trust Company

Directors elected to serve until December 1954 are as follows:

Loring Dam, Eastman, Dillon & Company
James W. Bracken, Insurance Company of North America
William C. Trapnell, Provident Mutual Life Insurance Co.

Other directors presently serving their terms include:

Term expires December, 1952:
- William Shupert, Studley, Shupert & Company
- Lawrence M. Stevens, Hemphill, Noyes, Graham, Parsons & Company

Term expires December, 1953:
- Samuel B. Jones, Fire Association of Philadelphia
- Thomas L. Ralph, Fidelity-Philadelphia Trust Company

THOMAS W. GORDON
Secretary

Marvin Chandler Addresses A S C S

Marvin Chandler, vice-president of Reis & Chandler, and vice-president of the New York Society of Security Analysts, was the guest speaker before the American Society of Corporate Secretaries at its January meeting in New York on January 15, 1952. Mr. Chandler spoke on the topic "What Does an Analyst Look for in an Annual Report?" and was the target in a question period at the conclusion of his talk. Among the needs stressed by Mr. Chandler were: financial statements of the preceding year, especially balance sheet and surplus reconciliation, for comparative purposes; breakdown of sales by divisions or markets; complete and understandable footnotes, particularly with respect to income and excess profits tax status, basis of consolidation, equity in unconsolidated subsidiaries, and inventory methods; a simple cash flow or source and disposition of funds statement; details as to construction plans, financing needs, and certificates of necessity; affiliations of directors; and prompt release of the report after the close of the year.

Luncheon and Dinner Forum Talks

FINANCIAL ANALYSTS OF PHILADELPHIA

SINCE JANUARY 1, 1951

Date	*Speaker*	*Topic*
Jan 4	Charles Shipman Assistant to vice-chairman, Allegheny Corp.	The Missouri Pacific Plan
Jan 11	F. J. Koegler Executive vice-president of corporation	Doehler-Jarvis Corp.
Feb 1	S. C. Allyn President of company	National Cash Register Co.
Feb 8	C. R. Smith President of company	American Airlines
Feb 21	John A. Hill President of company	Air Reduction Co.
Mar 1	George Martin Director of marketing	International Bank for Reconstruction and Development
Mar 15	A. F. Tegen President of corporation	General Public Utilities Corp.
Mar 22	B. B. Jennings President of company & chairman of executive committee	Socony-Vacuum Oil Co.
Mar 29	Francis S. Williams Vice-president, Chemical Fund	Outlook for the Chemical Industry
Apr 19	P. P. Stathas Duff & Phelps	Outlook for the Electric Utility Industry
Apr 26	Sumner Pike Commissioner, U. S. Atomic Energy Commission	Atomic Energy and Its Impact on American Industry
May 10	C. L. Patterson Vice-president & general manager	Lehigh Valley R.R. Co.
May 17	Duncan Merriweather Executive vice-president	Rohm & Haas Co.
May 24	Joseph A. Martino President of company	National Lead Co.
May 31	Panel Discussion *Chairman:* W. Linton Nelson President, Delaware Fund F. Elliott Farr Assistant vice-president, Girard Trust Corn Exchange Bank Samuel B. Jones Vice-president, Fire Association of Philadelphia Robert J. Ogilvie Assistant director of research, Wellington Fund	Portfolio Policy and Stock Selection for the Institutional Investor
Sept 27	Pierre R. Bretey Baker, Weeks & Harden	The Railroad Situation
Oct 4	Frank R. Palmer President of company	Carpenter Steel Co.
Oct 18	Henry B. Bryans President of company	Philadelphia Electric Co.
Oct 25	Imre de Vegh Partner, Pell, de Vegh & Co.; President, Pell de Vegh Mutual Fund	Investment Theory and Practice
Nov 1	C. F. Rassweiler Vice-chairman of corporation	Johns-Manville Corp.
Nov 15	Robert E. MacNeal President of company	Curtis Publishing Co.
Nov 29	Brison Wood Treasurer of company	Minneapolis-Honeywell Regulator Co.
Dec 6	J. M. Symes Vice-president in charge of operations	Pennsylvania R.R. Co.
Dec 13	E. Gordon Keith Wharton School, University of Pennsylvania; Consultant, U. S. Treasury Dept	The Federal Tax Picture

Admissions to NYSSA Membership

September 18, 1951 to January 25, 1952

ANAYA, John W., Merrill Lynch, Pierce, Fenner & Beane, 70 Pine St., New York
BENJAMIN, Bruce, Hettlemen & Co., 1 Wall St., New York
BLAESING, Dorothy A., Bankers Trust Co., 16 Wall St., New York
BLANCHARD, Richard F., Brown Brothers Harriman & Co., 59 Wall St., New York
BOYD, Fulton, Harriman Ripley & Co., 63 Wall St., New York
BOZIC, Alexander, Thomas & McKinnon, 11 Wall St., New York
CAROW, Philip W., Jr., Harriman Ripley & Co., 63 Wall St., New York
CERUENY, Ludwig O., Hallgarten & Co., 44 Wall St., New York
CORSO, Arthur H., Commonwealth Services, 20 Pine St., New York
CRAVEN, Robert, U. S. Trust Co., 45 Wall St., New York
CROUGH, Marjorie A., Arnold Bernhard & Co., 5 E. 44 St., New York
DENIOUS, George B., Bankers Trust Co., 16 Wall St., New York
DORSEY, Harold B., Argus Research Corp., 61 Broadway, New York
FERRITER, Joseph Francis, A. C. Israel & Co., 95 Front St., New York
FORBES, Gordon C., W. E. Burnet & Co., 11 Wall St., New York
FRANK, Charles A., Bankers Trust Co., 16 Wall St., New York
FURSE, George Ronald, Fiduciary Trust Co. of New York, 1 Wall St., New York
GAITHER, Paul H., Ball, Burge & Kraus, 1790 Union Commerce Bldg., Cleveland, Ohio
GLORIEUX, John P., Guaranty Trust Co. of New York, 140 Broadway, New York
GRAETZ, Adolph H., Arnold Bernhard & Co., 5 E. 44 St., New York
GREENFIELD, Elliot M., Standard & Poor's Corp., 345 Hudson St., New York
GREENWAY, Carl F., Spencer Trask & Co., 25 Broad St., New York
GULLIVER, Allan D., Merrill Lynch, Pierce, Fenner & Beane, 70 Pine St., New York
HAFF, Theodore L., Jr., Smith, Barney & Co., 14 Wall St., New York
HAMILTON, Grace B., Anthony Gaubis & Co., 37 Wall St., New York
HELLAWELL, George A., Hirsch & Co., 25 Broad St., New York
HENKEN, Fred Jr., American Surety Co., 100 Broadway, New York
HILL, Robert D., Newborg & Co., 25 Broad St., New York
JORDAN, J. Willard, Van Cleef, Jordan and Wood, 14 Wall St., New York
KARR, Arthur, Van Denburgh & Karr, 523 W. 6 St., Los Angeles
KELLEY, Malcolm S., American Securities Corp., 25 Broad St., New York
LARNER, Robert J., Hanover Fire Insurance Co., 111 John St., New York
LEFFERTS, John, Bankers Trust Co., 16 Wall St., New York
LINDSAY, Dale A., Dale A. Lindsay, 21 W. Putnam Ave., Greenwich, Conn.
LOEB, Henry Dale, Shell Oil Co., RCA Bldg., 50 W. 50 St., New York
MacGREGOR, Donald H., Jacques Coe & Co., 39 Broadway, New York
MARACHE, Theodore, U. S. Trust Co., 45 Wall St., New York
MARTIN, Lee Gwynne, Chubb & Son, 90 John St., New York
McCARTHY, Charles E. A., Jr., Bankers Trust Co., 16 Wall St., New York
McNAMARA, Daniel F., Albert Frank-Guenther Law, 131 Cedar St., New York
MEYER, Richard, *Wall Street Journal,* 44 Broad St., New York
MOREHOUSE, Edward J., Harriman Ripley & Co., 63 Wall St., New York
MORGENSTERN, Bernard, Cohen, Simonson & Co., 120 Broadway, New York
MYLES, Jack A., Central National Corp., 100 Park Ave., New York
NEWQUIST, Lester J., Brown Brothers Harriman & Co., 59 Wall St., New York
ORR, Everett, Jr., Bankers Trust Co., 16 Wall St., New York
PARKS, Robert O., Burton, Cluett & Dana, 120 Broadway, New York
PARSONS, Lawrence L., Bank of Manhattan, 40 Wall St., New York
PERERSEN, Lloyd Winham, U. S. Trust Co., 45 Wall St., New York
POOLE, Alan Cornell, Hemphill, Noyes, Graham, Parsons & Co., 15 Broad St., New York
REAM, John W., American Reinsurance Co., 99 John St., New York
REDFIELD, Charles H., Bankers Trust Co., 16 Wall St., New York
RICCIARDI, Franc M., New York Institute of Finance, 20 Broad St., New York
ROSE, Menko, Jr., Model, Roland & Stone, 76 Beaver St., New York
SCHNEIDER, Elliot, Arnold Bernhard & Co., 5 E. 44 St., New York
SHAFFER, Leon R., Bankers Trust Co., 16 Wall St., New York
SHASKAN, George F., Jr., Shaskan & Co., 40 Exchange Pl., New York
SHEA, Harrie T., Bear, Stearns & Co., 1 Wall St., New York
SHIELDS, Murray, Bank of Manhattan Co., 40 Wall St., New York
SIMPSON, William H. B., Belk, Simpson Co., Greenville, S. C.
SOLOW, Richard C., Lehman Bros., 1 William St., New York
SPURDLE, Alfred Jr., Brown Brothers Harriman & Co., 59 Wall St., New York
STEPHENS, John W., Hoore and Stephens, 1605 Tower Petroleum Bldg., Dallas, Tex.
VOORHEES, Romeyn Van Z., Bankers Trust Co., 16 Wall St., New York
WARD, Frank F., Argus Research Corp., 61 Broadway, New York
WARNER, Marion M. (Mrs. R. Y.), Brown Brothers Harriman & Co., 59 Wall St., New York
WESTCOTT, John M., U. S. Trust Co., 45 Wall St., New York
WILLIAMS, Cecil B., Fahnestock & Co., 65 Broadway, New York
WINTER, Proctor, Harriman Ripley & Co., 63 Wall St., New York
WOOD, Jabes H., Van Cleef, Jordan and Wood, 14 Wall St., New York

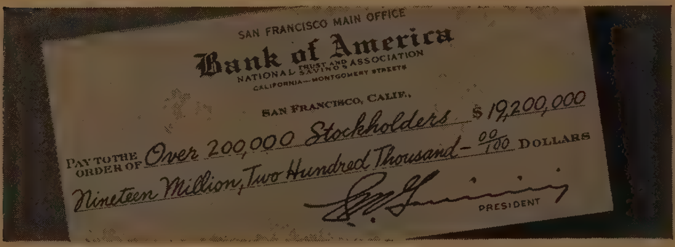
Luncheon Forum Talks

NEW YORK SOCIETY OF SECURITY ANALYSTS

SINCE SEPTEMBER 30, 1951

Date	*Speaker*	*Topic*
Oct 4	Paul Raibourne Vice-president, Paramount Pictures Corp.	The Motion Picture Industry Outlook
Oct 5	Edward F. Barrett President of company Robert G. Olmsted Vice-president of company	Long Island Lighting Co.
Oct 8	L. D. Campbell Vice-president & secretary-treasurer	Halliburton Oil Well Cementing Co.
Oct 9	R. W. Kerr President of company	Bingham-Herbrand Corp.
Oct 11	Walter K. Gutman Goodbody & Co. John F. Bohmfalk Clark Dodge & Co. *Panel Speakers:* Jeremy C. Jenks C. J. Lawrence & Co. Francis S. Williams F. Eberstadt & Co.	The Philosophy of Investing in the Chemical Industry
Oct 15	Frederick Kugel Editor, *Television Magazine*	The Outlook for the Television Industry
Oct 16	Victor Lea Walston, Hoffman & Goodwin	The Future of Commodity Prices
Oct 18	H. H. Scaff Vice-president, Ebasco Services R. S. Holmes Division of Public Utilities, SEC	Accelerated Amortization of Emergency Facilities
Oct 19	Thomas C. Campbell Editor, *Iron Age*	Outlook for the Steel Industry
Oct 22	Lucien O. Hooper W. E. Hutton & Co. James F. Hughes Auchincloss, Parker & Redpath Walter Maynard Shearson, Hamill & Co.	Outlook for the Stock Market
Oct 23	Norman C. Naylor President of company	Union Asbestos & Rubber Co.
Oct 24	McGregor Smith President of company	Florida Power & Light Co.
Oct 25	Herman A. Katz Vice-president of company	Jacob Ruppert
Oct 26	W. A. Roberts President of company	Allis-Chalmers Manufacturing Co.
Oct 30	H. Gardiner Symonds President of company	Tennessee Gas Transmission Co.
Oct 31	J. L. McCaffrey President of company	International Harvester Co.
Nov 1	Howard L. Spindler Vice-president of corporation	American Radiator & Standard Sanitary Corp.
Nov 2	Herbert F. Wyeth Shields & Co.	Financing Ahead for the Trucking Industry
Nov 7	T. A. Schlink President & general manager	Central Illinois Light Co.
Nov 13	Reese H. Taylor President of company	Union Oil Co. of Calif.
Nov 14	Col. C. F. H. Johnson President of company	Botany Mills
Nov 15	Harold J. Loynd President of company	Parke, Davis & Co.
Nov 16	Thomas O. Waage Manager, Public Information Dept., Federal Reserve Bank of New York	The Money Market and the Stock Market
Nov 19	Charles E. Ide President of company	Toledo Edison Co.

Date	Speaker	Topic
Nov 20	Roy Fruehauf President of company	Fruehauf Trailer Co.
Nov 23	David A. Shepard Executive assistant to president	Standard Oil Co. (N. J.)
Nov 27	Frank H. Buck	The DuPont Story
Nov 28	B. F. Pickard President of company	Interstate Power Co.
Nov 29	W. A. Johnston President of company	Illinois Central R.R. Co.
Nov 30	W. V. McMenimen President of company	Raymond Concrete Pile Co.
Dec 3	Bernard Peyton President of company L. K. Sillcox Executive vice-president	New York Air Brake Co.
Dec 4	James G. Shennan President of company	Elgin National Watch Co.
Dec 5	William G. Marbury President of corporation	Mississippi River Fuel Corp.
Dec 6	John Jay Hopkins President of company	Electric Boat Co.
Dec 7	J. M. Symes Vice-president of company	Pennsylvania R.R. Co.
Dec 11	O. R. Cheatham President of company	Georgia-Pacific Plywood Co.
Dec 12	J. A. Fuller President of company	Shawinigan Water & Power Co.
Dec 13	A. E. Walker President of company	National Supply Co.
Dec 18	C. McD. Davis President of company	Atlantic Coast Line RR. Co.
Dec 20	John W. Crosby President & treasurer of Corporation	Thiokol Corp.


SAN FRANCISCO MAIN OFFICE
Bank of America
NATIONAL TRUST AND SAVINGS ASSOCIATION
CALIFORNIA—MONTGOMERY STREETS
SAN FRANCISCO, CALIF.,
PAY TO THE ORDER OF Over 200,000 Stockholders $ 19,200,000
Nineteen Million, Two Hundred Thousand - 00/100 DOLLARS
PRESIDENT

Dividend...Bank of America NT&SA

For the convenience of stockholders who wish to have dividend funds available before their quarterly Federal Income Tax payments are due, the Board of Directors adopted a new schedule of dividend payments. The first quarterly $.40 instalment of the current semi-annual period will be paid according to the old schedule on March 31, 1952, to stockholders of record as of February 29, 1952. The second quarterly instalment, however, will be paid on May 31, 1952, to stockholders of record on May 15, 1952. In the past this quarterly payment has been made on June 30.

Q. Who owns the Bank of America?
A. More than 200,000 shareholders!

Ownership of the Bank of America N.T.&S.A.—which was founded in 1904 with $150,000 and now has total resources over seven and one-half billion dollars—is held by more than 194 thousand men and women and 6,185 institutions. Bank of America stock is an important asset of many institutions, including labor, fraternal and fiduciary organizations, foundations, investment trusts, insurance companies and savings banks.

Bank of America N.T.&S.A. is a member of the Federal Deposit Insurance Corporation

BANKING THAT IS BUILDING CALIFORNIA

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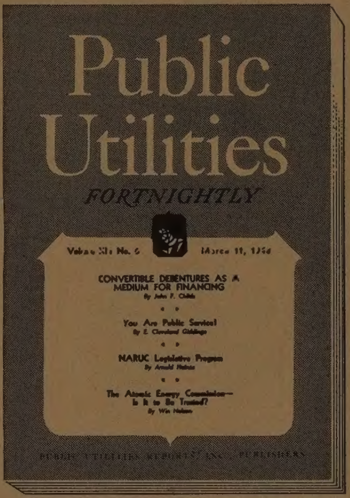
For the

SECURITY ANALYST

. . . a primary source
of important information
about the public utility industry


Public Utilities
FORTNIGHTLY
CONVERTIBLE DEBENTURES AS A MEDIUM FOR FINANCING
You Are Public Service!
NARUC Legislative Program
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AMONG the many practical and unique values of PUBLIC UTILITIES FORTNIGHTLY to security analysts and others interested in the financial and related aspects of the utilities, is the fact that each issue contains timely information on the over-all utility industry scene, not assembled elsewhere in a single publication. Moreover, the leading articles, written by competent observers, and a major part of the material in the several regular departments of the magazine constitute a primary source of authoritative and pertinent information covering the many and varied factors entering into the conduct of the utility business. Most of this material, by way of interpretation and analysis, is available from no other source.

The FORTNIGHTLY brings its readers a well-rounded report every two weeks of major happenings of interest and concern, relating to finance, management, operation and other matters coming within the scope of utility regulation and allied topics. Thus, the FORTNIGHTLY serves as an essential supplement to the customary statistical and other data which analysts normally gather regarding security issues of utility companies.

The FORTNIGHTLY is Published Every Other Thursday—26 Issues a Year—Annual Subscription
$15

Financial Articles

The broader aspects of financial questions are frequently discussed in leading articles, bringing to light the results of major problems in finance. Over a period of more than 20 years, the FORTNIGHTLY has specialized in the important field of regulation and allied subjects pertaining to all branches of the utilities—electric, gas, pipeline, telephone, transit and water companies.

Featured Departments

Departmentalized for convenient reading are these special sections of the magazine which appear regularly: Washington and the Utilities, Exchange Calls and Gossip, **Financial News and Comment**, What Others Think, Progress of Regulation, The March of Events and Industrial Progress. This material has been found especially helpful to investment interests.

Financial News and Comment

Particular attention is given by the editorial staff to the financial activities of the utility industries. Among the many classifications of subjects covered are: Earnings data, new financing, refundings, forecasts, reorganizations, mergers, sales, regulations relating to financial operations, and statistical reviews, embracing original charts, graphs and special studies.

PUBLIC UTILITIES *FORTNIGHTLY*

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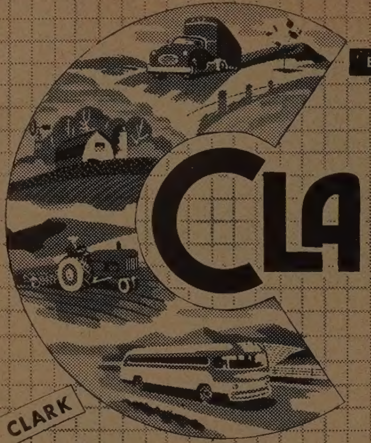

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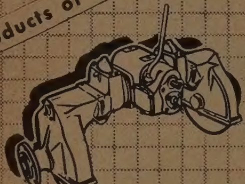
CLARK EQUIPMENT COMPANY

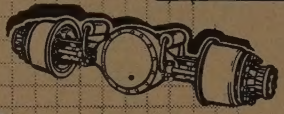
Products of CLARK

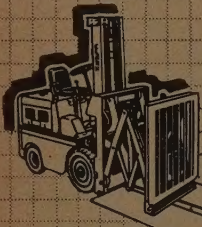


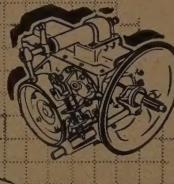
The Company has mailed to all shareholders as of February 15, 1952, a preliminary report containing the financial statements for the year ended December 31, 1951, certified by the company's independent public accountants, Price Waterhouse & Co. The financial report and operating particulars presented here in condensed form have been prepared by the company from the more detailed certified financial statements. Copies of the preliminary report to shareholders are available upon request sent to the Secretary at the home office of the company at Buchanan, Michigan.

CLARK EQUIPMENT COMPANY
GEORGE SPATTA, *President*
George Spatta

Condensed Financial Report December 31, 1951





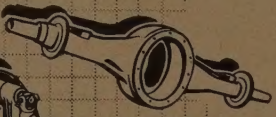


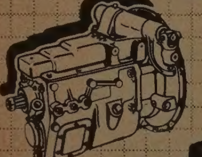
ASSETS

CURRENT ASSETS:		
Cash	$ 7,740,083	
Accounts receivable	14,336,969	
Inventories—at lower of cost or market	26,707,299	
Prepaid expense and sundry debtors	416,609	$49,200,960
LONG-TERM RECEIVABLES, ETC.		405,452
LAND, BUILDINGS, MACHINERY, ETC.	$26,133,427	
Less—Depreciation and amortization	11,074,950	15,058,477
		$64,664,889

LIABILITIES

CURRENT LIABILITIES, including $8,000,000 of notes payable to banks under revolving credit agreement		$21,605,508
3¾% NOTE PAYABLE (due in annual installments of $750,000 from 1953 to 1965, inclusive, and balance on August 1, 1966)		12,000,000
CAPITAL STOCK AND RETAINED EARNINGS—		
Preferred 5% Cumulative—par value $100 per share (19,027 shares)	$ 1,902,700	
Common—par value $20 per share (678,525 shares)	13,570,500	
Capital in excess of par value of shares	1,029,422	
Earnings retained and used in the business	14,851,459	
	$31,354,081	
Less—Treasury stock (17,244 shares of Common at cost and 1,101 shares of Preferred at par)	294,700	31,059,381
		$64,664,889

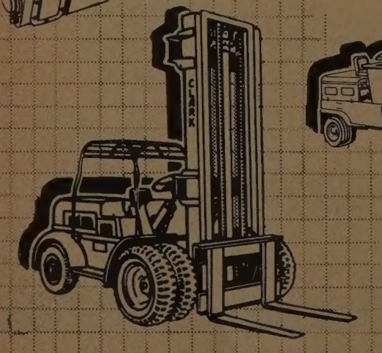


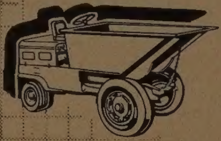


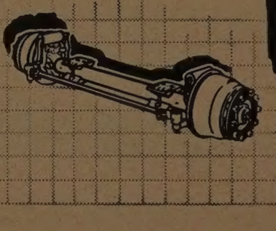
SALES, INCOME and other particulars for the calendar years 1951 and 1950

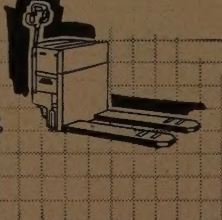
	1951	1950
SALES	$130,147,944	$68,602,524
Income before federal taxes	$ 16,376,726	$ 8,781,552
Provision for federal income and excess profits taxes	11,100,000	4,000,000
NET INCOME—for the year	$ 5,276,726	$ 4,781,552
DIVIDENDS PAID—		
In cash—Common stock—$3.00 per share	$ 1,885,222	$ 1,590,711
Preferred Stock—$5.00 per share	89,630	89,630
In common stock—25% stock dividend to common shareholders	3,066,527	—
TOTAL DIVIDENDS	$ 5,041,379	$ 1,680,341
EARNINGS—per share of Common stock outstanding (after dividends paid to Preferred shareholders)	$ 7.84	$ 7.09*

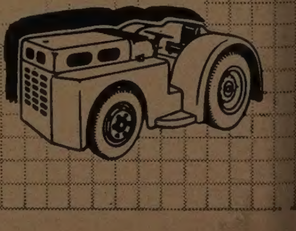
*Adjusted for increased number of shares resulting from 1951 stock dividend.

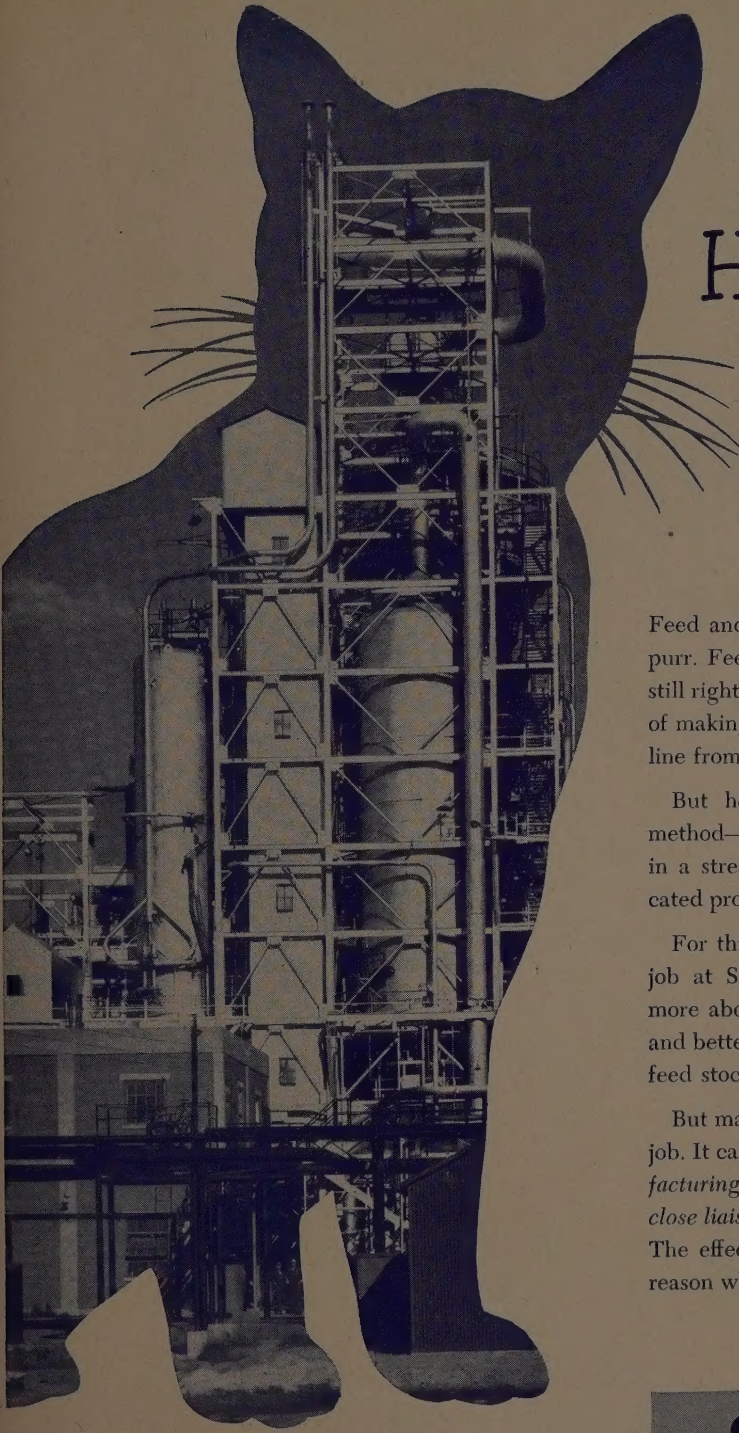












How to make a "cat" *purr*

Feed and handle a tabby cat right and she will purr. Feed and handle a fluid catalytic cracking still right and this "cat" will purr too—to the tune of making up to 70 per cent of high octane gasoline from a given quantity of oil.

But here's the rub. The fluid cat-cracking method—which uses a powdered solid circulating in a stream of oil vapor—is a delicate, complicated process.

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Ammonium Sulphate
Nitric Acid
Dry Ice and Carbonic Gas
Hypochlorite Products
Hydrazine Products
Ethylene Glycol
Diethylene Glycol
Triethylene Glycol
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